TABLE III—ENDURANCE TEST SCHEDULE

Description	Load range	Test wheel speed		Test load: Percent of maximum load rating			Total test revolution (thousands)
		km/h	r/m	Step I (7 hours)	Step II (16 hours)	Step III (24 hours)	
Speed-restricted service:							
90 km/h (55 mph)	All	40	125	66	84	101	352.5
80 km/h (50 mph)	C, D	48	150	75	97	114	423.0
	E, F, G, H, J, L, M, N	32	100	66	84	101	282.0
56 km/h (35 mph)	All	24	75	66	84	101	211.5
Motorcycle	All	80	250	[a]100	[b]108	117	510.0
All other	A, B, C, D	80	250	[a]75	[b]97	114	510.0
	E	64	200	70	88	106	564.0
	F	64	200	66	84	101	564.0
	G	56	175	66	84	101	493.5
	H, J, L, M, N	48	150	66	84	101	423.0

[a] 4 hours for tire sizes subject to high speed requirements S6.3.
[b] 6 hours for tire sizes subject to high speed requirements S6.3.

* * * * *

■ 5. Amend § 571.139 by:
■ a. Revising paragraph S2;
■ b. Revising paragraph S4.1.1(a);
■ c. Revising paragraph S6.2.1.1.1;
■ d. Revising paragraph S6.3.1.1.1; and
■ e. Revising paragraph S6.4.1.1.1.

The revisions read as follows:

§ 571.139 Standard No. 139; New pneumatic radial tires for light vehicles.

* * * * *

S2 *Application.* This standard applies to new pneumatic radial tires for use on motor vehicles (other than motorcycles and low speed vehicles) that have a gross vehicle weight rating (GVWR) of 10,000 pounds or less and that were manufactured after 1975. This standard does not apply to special tires (ST) for trailers in highway service, tires for use on farm implements (FI) in agricultural service with intermittent highway use, tires with rim diameters of 12 inches and below, T-type temporary use spare tires with radial construction, and light truck tires with a tread depth of 18/32 inch or greater.

* * * * *

S4.1.1 * * *

(a) Listed by manufacturer name or brand name in a document furnished to dealers of the manufacturer's tires, to any person upon request, and in duplicate to the Docket Section (No. NHTSA–2009–0117), National Highway Traffic Safety Administration, West Building, 1200 New Jersey Ave. SE, Washington, DC 20590; or

* * * * *

S6.2.1.1.1 Mount the tire on a test rim and inflate it to the pressure specified for the tire in the following table:

Tire application	Test pressure (kPa)
Passenger car tires:	
Standard load	220
Extra load	260
Light truck tires with a nominal cross section ≤295 mm (11.5 inches):	
Load Range C	320
Load Range D	410
Load Range E	500
Light truck tires with a nominal cross section >295 mm (11.5 inches)	
Load Range C	230
Load Range D	320
Load Range E	410

* * * * *

S6.3.1.1.1 Mount the tire on a test rim and inflate it to the pressure specified for the tire in the following table:

Tire application	Test pressure (kPa)
Passenger car tires:	
Standard load	180
Extra load	220
Light truck tires with a nominal cross section ≤295 mm (11.5 inches)	
Load Range C	260
Load Range D	340
Load Range E	410
Light truck tires with a nominal cross section >295 mm (11.5 inches)	
Load Range C	190
Load Range D	260
Load Range E	340

* * * * *

S6.4.1.1.1 This test is conducted following completion of the tire endurance test using the same tire and rim assembly tested in accordance with S6.3 with the tire deflated to the following appropriate pressure:

Tire application	Test pressure (kPa)
Passenger car tires.	
Standard load	140
Extra load	160
Light truck tires with a nominal cross section ≤295 mm (11.5 inches)	
Load Range C	200
Load Range D	260
Load Range E	320
Light truck tires with a nominal cross section >295 mm (11.5 inches)	
Load Range C	150
Load Range D	200
Load Range E	260

* * * * *

Issued in Washington, DC, under authority delegated in 49 CFR 1.95 and 501.5.

Steven S. Cliff,

Acting Administrator.

[FR Doc. 2021–18633 Filed 8–30–21; 8:45 am]

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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R2–ES–2018–0104; FF09E21000 FXES11110900000 212]

RIN 1018–BD35

Endangered and Threatened Wildlife and Plants; Threatened Species Status for Bartram's Stonecrop With a Section 4(d) Rule

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), determine threatened species status under the Endangered Species Act of 1973 (Act), as amended, for Bartram's stonecrop (*Graptopetalum bartramii*), a plant known from Arizona and Mexico. We also issue a final rule under the authority of section 4(d) (a ''4(d) rule'') of the Act that provides measures that are necessary and advisable to provide for the conservation of Bartram's stonecrop. We have determined that designation of critical habitat for Bartram's stonecrop is not prudent.

DATES: This rule is effective September 30, 2021.

ADDRESSES: This final rule is available on the internet at *http://www.regulations.gov* under Docket No. FWS–R2–ES–2018–0104 and at *https://www.fws.gov/southwest/.* Comments and materials we received, as well as supporting documentation we used in preparing this rule, are available for public inspection at *http://www.regulations.gov* under Docket No. FWS–R2–ES–2018–0104.

FOR FURTHER INFORMATION CONTACT: Jeff Humphrey, U.S. Fish and Wildlife Service, Arizona Ecological Services Field Office, 9828 North 31st Avenue, #C3, Phoenix, AZ 85051–2517. 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, a species may be listed as endangered or threatened throughout all or a significant portion of its range. Listing a species as an endangered or threatened species can only be completed by issuing a rule. Further, under the Act, any species that is determined to be an endangered or threatened species requires critical habitat to be designated, to the maximum extent prudent and determinable.

What this document does. This rule lists Bartram's stonecrop (*Graptopetalum bartramii*) as a threatened species. This document also finalizes a rule under the authority of section 4(d) of the Act that provides measures that are necessary and advisable to provide for the conservation of Bartram's stonecrop.

The basis for our action. Under the Act, we may 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. We have determined that Bartram's stonecrop faces the following threats: 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); illegal collection (Factor B); and small population size (Factor E). The existing regulatory mechanisms are not adequate to address these threats such that the species does not meet the Act's definition of an endangered or threatened species (Factor D).

Section 4(a)(3) of the Act requires the Secretary of the Interior (Secretary) to designate critical habitat concurrent with listing to the maximum extent prudent and determinable. In this case, we have found that the designation of critical habitat for Bartram's stonecrop is not prudent at this time.

Peer review and public comment. A species status assessment (SSA) team prepared an SSA report for Bartram's stonecrop. The SSA team was composed of Service biologists, in consultation with other species experts. The SSA report represents a compilation of the best scientific and commercial data available concerning the status of the species, including the impacts of past, present, and future factors (both negative and beneficial) affecting the species. We sought the expert opinions of three independent and knowledgeable specialists regarding the species status assessment (SSA) report and received responses from two reviewers. These peer reviewers generally concurred with our methods and conclusions, and provided additional information, clarifications, and suggestions to improve the SSA. We also considered all comments and information we received from the public during the comment period for the proposed listing of Bartram's stonecrop.

Previous Federal Actions

On December 6, 2019, we published in the **Federal Register** (84 FR 67060) a proposed rule to list Bartram's stonecrop as a threatened species under the Act (16 U.S.C. 1531 *et seq.*). Our proposed rule included a proposed 4(d) rule for Bartram's stonecrop. The December 6, 2019, rule also proposed to list the beardless chinchweed (*Pectis imberbis*) as an endangered species and designate critical habitat for the species. We addressed our proposal to list the beardless chinchweed as an endangered species and designate critical habitat for that species in a separate **Federal Register** document on June 15, 2021. Please refer to the December 6, 2019, proposed rule for a detailed description of previous Federal actions concerning Bartram's stonecrop that occurred prior to December 6, 2019.

Summary of Changes From the Proposed Rule

In preparing this final rule, we reviewed and fully considered comments from the public on the proposed rule. We did not make any substantive changes to this final rule after consideration of the comments we received. We updated the SSA report (to version 2.0) based on comments and additional information provided as follows:

(1) We included updated survey information provided to the Service and other reports of additional occurrences we received.

(2) We incorporated additional information regarding stressors to specific populations provided by land managers.

(3) We made many small, nonsubstantive clarifications and corrections throughout the SSA report and this rule, including under Summary of Biological Status and Threats, below, in order to ensure better consistency, clarify some information, and update or add new references. We considered whether this additional information altered our analysis of the magnitude or severity of threats facing the species. We conclude that the information we received during the comment period for the proposed rule did not change our previous analysis of the magnitude or severity of threats facing the species or our determination that Bartram's stonecrop is a threatened species.

I. Final Listing Determination

Background

Bartram's stonecrop is a small, succulent, perennial plant and a member of the Crassulaceae family. It occurs in shaded evergreen woodlands on rocky canyon outcrops at elevations ranging from 3,500 to 6,800 ft. The species is particularly susceptible to reductions in water availability, altered fire regime, and the effects of small population size. Most populations are very small, with 58 percent of extant populations throughout the range of the species supporting fewer than 50 individuals. These small populations

are particularly vulnerable to extirpation.

Current Condition of Bartram's Stonecrop

Since 1924, we are aware of three populations that have been extirpated in the United States in recent years, and another that has contracted in size. Currently, 50 extant Bartram's stonecrop populations occur across 12 mountain ranges, nine in southern Arizona and three in northern Mexico. 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. The U.S. populations total 4,628 individuals within occupied habitats that total approximately 7 hectares (17 acres). This estimate includes 10 plants from two U.S. populations (Gardner Canyon East and Thomas Canyon) and one Mexico population (Sierra La Estancia) that have not been revisited since the initial survey in 1980.

Please refer to the December 6, 2019, proposed rule to list Bartram's stonecrop with a species-specific rule under section 4(d) of the Act (84 FR 67060) and the SSA report for a full summary of species information. Both are available on our Southwest Region website at *https://www.fws.gov/southwest/* and at *http://www.regulations.gov* under Docket No. FWS–R2–ES–2018–0104.

Regulatory and Analytical Framework

Regulatory Framework

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

Analytical Framework

The SSA report documents the results of our comprehensive biological status review for the species, including an assessment of the potential threats to the species. The SSA report does not represent a decision by the Service on whether the species should be listed as an endangered or threatened species under the Act. It does, however, provide the scientific basis that informs our regulatory decisions, which involve the further application of standards within the Act and its implementing regulations and policies. The following is a summary of the key results and conclusions from the SSA report; the full SSA report can be found at Docket No. FWS–R2–ES–2018–0104 on *http://www.regulations.gov* and at *https://www.fws.gov/southwest/.*

To assess Bartram's stonecrop viability, we used the three conservation biology principles of resiliency, redundancy, and representation (Shaffer and Stein 2000, pp. 306–310). Briefly, resiliency supports the ability of the species to withstand environmental and demographic stochasticity (for example, wet or dry, warm or cold years), redundancy supports the ability of the species to withstand catastrophic events (for example, droughts, large pollution events), and representation supports the ability of the species to adapt over time to long-term changes in the environment (for example, climate changes). In general, the more resilient and redundant a species is and the more representation it has, the more likely it is to sustain populations over time, even

under changing environmental conditions. Using these principles, we identified the species' ecological requirements for survival and reproduction at the individual, population, and species levels, and described the beneficial and risk factors influencing the species' viability.

The SSA process can be categorized into three sequential stages. During the first stage, we evaluated the individual species' life-history needs. The next stage involved an assessment of the historical and current condition of the species' demographics and habitat characteristics, including an explanation of how the species arrived at its current condition. The final stage of the SSA involved making predictions about the species' responses to positive and negative environmental and anthropogenic influences. This process used the best available information to characterize viability as the ability of a species to sustain populations in the wild over time. We use this information to inform our regulatory decision.

Summary of Biological Status and Threats

In this discussion, we review the biological condition of the species and its resources, and the threats that influence the species' current and future condition, in order to assess the species' overall viability and the risks to that viability. Bartram's stonecrop occurs between elevations of 3,500 to 6,800 ft in Madrean woodlands with oaks, junipers, pines and species found in more mesic (wet) areas including sycamores, cottonwoods, and willows. The species typically occurs on rocky outcrops in deep, narrow canyons in heavy cover of litter and shade; and typically within 10 meters (m; 32.8 feet (ft)) of flowing or intermittent water. Bartram's stonecrop requires adequate precipitation to maintain soil moisture, cooler temperatures, and humidity in the microenvironment and for germination, growth and reproduction. Based on microhabitats in which the species is typically found, 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. In addition, the habitat must support sufficient Bartram's stonecrop pollinators (*e.g.,* flies, bees, and butterflies) including plants for pollinator foraging and nesting within pollinator flight distance of Bartram's stonecrop populations. To maintain the species' viability, populations with multiple subpopulations and overall high abundance must be distributed across the species range and represent a range of environmental conditions. These populations must experience recruitment that exceeds mortality.

Several stressors influence whether Bartram's stonecrop 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 Bartram's stonecrop) that influence the viability of the species. We describe these stressors on viability in detail in chapter 4 of the SSA report (Service 2020a, entire). Stressors that have the potential to affect Bartram's stonecrop's population resiliency include:

- Loss of water in nearby drainages from climate change (drought) and mining;
- Altered fire regime resulting from fires ignited by recreationists, cross-border human activity, and lightning and exacerbated by nonnative plants;
- Altered precipitation, drought, flooding, and freezing regime from current and future climate change;
- Erosion, sedimentation, and burial from mining, recreation trails and roads, cross-border human activity, and post-wildfire runoff;
- Trampling from humans, and trampling and herbivory from wildlife and livestock;
- Illegal collection; and
- Small population size exacerbating all other stressors.

The largest risk to viability of the species is caused by the loss of habitat and includes: (1) Groundwater extraction and prolonged drought that 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 and burial of individuals by post-fire runoff, 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 are currently reducing and are expected to continue to reduce nearby water levels, shade, and humidity within Bartram's stonecrop habitat or directly impact individuals.

Loss of Water

Dewatering of streams from mining operations may lead to overstory canopy losses and subsequent loss of shade, as well as reductions in spring and stream flow and humidity in nearby Bartram's stonecrop populations. The Rosemont Mine Final Environmental Impact Statement (Statement) notes that no Bartram's stonecrop individuals were found in the project area or the footprint of the associated actions; however, individuals growing in the analysis area could experience indirect impacts from groundwater drawdown (USFS 2013a, p. 676). According to the Statement, 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 (USFS 2013a, p. 339). The Bartram's stonecrop plants growing just southwest of the proposed Rosemont Mine were analyzed in the Rosemont Final Environmental Impact Statement (USFS 2013a, pp. 346–350). The predicted groundwater drawdown in the affected population at the end of active mining is 0.1–5 feet, depending on the site assessed and the model used. At 20 years from the mine closure, the predicted drawdown increases to a maximum of 15–20 feet. 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 and changes in soil moisture and humidity are expected to negatively affect the plant. For example, loss of groundwater in the unmapped spring in Box Canyon/Sycamore Canyon confluence, between Ruelas Spring and the Singing Valley Road residences, could substantially impact Bartram's stonecrop plants growing nearby (just southwest of the proposed Rosemont Mine).

Mining claims, trenching and exploration drilling activities, and a few active and proposed mines are present in Bartram's stonecrop's range. Many currently undeveloped areas of locatable mineral deposits may be explored and/or mined in the future. We do not know the full 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 with Bartram's stonecrop occurrences (USFS 2012, entire). The loss or reduction of groundwater, stream flow, or spring flow in or near a Bartram's stonecrop population due to mining-related activities could lead to extirpation of that population.

Altered Fire Regime

Wildfire frequency in western forests from the mid-1980s to the present has nearly quadrupled compared to 1970–1985. The timing, frequency, extent, and destructiveness of wildfires are

expected to continue to increase (Westerling *et al.* 2006, p. 943), given historical land management actions, an increase in fire starts from cross-border human activity 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). Direct impacts of fire include burning of Bartram's stonecrop individuals, resulting in injury, reduction in reproductive structures, or plant mortality. 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 to 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). Fire primarily alters hydrology and erosion processes by consumption of the protective canopy, ground cover, and organic matter. When plants and litter are removed by fire, ground surface protection is decreased, less rainfall is intercepted, and less infiltration occurs (Pierson et al. 2011, p. 443). The exposed bare soil becomes susceptible to increased runoff generation and sediment detachment and transport (Pierson et al. 2011, p. 444). Amplified runoff post-fire carries sediment (Pierson et al. 2011, p. 443), causing erosion or burial of Bartram's stonecrop plants.

We are aware of 11 wildfires that occurred in known Bartram's stonecrop sites from 2007–2017, killing some Bartram's stonecrop individuals and removing shade in some sites (Ferguson 2014, pp. 9–10, 15, 28–29; Ferguson 2016a, p. 13; Ferguson 2016b, entire; Ferguson 2017b, p. 32; Ferguson 2017c, p. 2). Although we do not have pre-fire population counts in any population, two of the largest Bartram's stonecrop populations occur in sky island mountain ranges that have had the fewest acres burned from 2010–2017, which indicates these populations may have experienced less of the detrimental effects of fire than smaller populations. Wildfires have burned in all nine sky island mountain ranges of southern Arizona with known Bartram's stonecrop occurrences within the last decade. Wildfire could potentially cause extirpation of small Bartram's stonecrop populations throughout the range of the species and have negative impacts on larger populations. Bartram's stonecrop seeds are very tiny, reside at or near the soil surface (Shohet 1999, p. 48), and show no characteristics that would promote survival in a wildfire.

The nonnative plants in the uplands surrounding and within Bartram's stonecrop populations include nonnative grass species such as Lehmann's lovegrass and rose natal, both of which have numerous advantages over native grasses. Lehmann'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 (Service 2020a, p. 50). Rose natal is capable of growing in low moisture situations, has prolific seed production, and has stems that root from the nodes (Stokes *et al.* 2011, p. 527). Both species outcompete native plants, reduce structural and spatial diversity of habitats, and increase biomass and fuel loads, increasing the fire frequency. Nonnative grasses have been reported with Bartram's stonecrop individuals in four instances, at Sycamore Canyon, French Joe Canyon, Shaw Canyon, and Juniper Flat populations, and upslope of several populations of Bartram's stonecrop in the Dragoon Mountains, increasing the likelihood of fire occurrence and subsequent impacts to these populations (Heritage Database Management System, E.O. 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.

Altered Precipitation, Drought, Flooding, and Freezing Regimes

The southwestern United States is warming and experiencing severe droughts of extended duration, changes in amount of snowpack and timing of snowmelt, and changes in timing and severity of precipitation and flooding (Garfin *et al.* 2014, entire). The effects of a changing climate are important considerations in the analysis of the stressors to Bartram's stonecrop, including increased nonnative competition (described above) and altered fire regimes during times of altered precipitation and drought. To analyze the effects of a changing climate to Bartram's stonecrop, we relied on the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment (IPCC 2014, entire) and IPCC Climate Change 2013—The Physical Science Basis (IPCC 2013, entire). Four emission scenarios, referred to as Representative Concentration Pathways (RCPs), were developed for the IPCC report (IPCC 2014, p. 57). We evaluated the effects of climate change on Bartram's stonecrop using RCP 4.5 and RCP 8.5 to bracket the range of environmental variability. The IPCC report (2014) expresses confidence that emissions will fall within the RCP 4.5–8.5 range.

Precipitation is bimodal within the mountain ranges where Bartram's stonecrop occurs, with winter snow and rain, and summer monsoon rain. Fall and winter (October through March) precipitation is needed for Bartram's stonecrop germination, and both summer (July and August) and fall (October and November) precipitation 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 stressors influencing the viability of Bartram's stonecrop due to impacts on moisture availability for germination, growth, and flowering. In addition, due to increased nonnative competition during times of reduced precipitation and drought, impacts from these stressors to Bartram's stonecrop populations would be exacerbated.

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. Late winter-spring mountain snowpack in the Southwest is predicted to continue to decline over the 21st century under RCP 4.5 and 8.5 because of increased temperature (Garfin *et al.*

2013, pp. 6, 119). 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 (Garfin 2013, p. 117).

Precipitation timing and amount impact the germination, growth, and flowering of Bartram's stonecrop, resulting in the loss of individuals and recruitment, and overall reducing the population size. Climatic events such as reduced snowpack, earlier snowmelt, and increased drought are regional and will impact all populations of Bartram's stonecrop.

In the Southwest, the period since 1950 has been warmer than any period of comparable length in at least 600 years, and average daily temperatures for the 2001–2010 decade were the highest in the time period including 1901–2010 (Garfin *et al.* 2013, p. 3). Fewer cold waves and more heat waves occurred over the Southwest during 2001–2010 compared to average decadal occurrences in the 20th century. More frequent hot and fewer cold temperature extremes over most land areas are predicted on daily and seasonal timescales, as global mean surface temperature increases (IPCC 2014, p. 58). Heat waves are predicted to occur with a higher frequency and longer duration (IPCC 2014, p. 58). Occasional cold winter extremes will continue to occur (IPCC 2014, p. 60). Surface temperatures in the Southwest are predicted to increase substantially over the 21st century, with more warming in summer and fall than in winter and spring. Summer heat waves will become longer and hotter, while winter cold snaps will become less frequent but not necessarily less severe (Garfin *et al.* 2013, p. 6; Garfin *et al.* 2014, p. 464).

When temperatures rise, evapotranspiration rates also increase and soil moisture decreases. 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, reduce overall recruitment and population numbers.

Along with projected warming and increased evapotranspiration, droughts in parts of the Southwest will become hotter, more severe, and more frequent (Garfin *et al.* 2013, pp. 6, 137–138). Future droughts are projected to be substantially hotter, and for major river basins such as the Colorado River Basin, drought is projected to become more frequent, intense, and longer lasting than in the historical record. 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).

Although rare species in the southwestern United States evolved with drought, recent changes in temperature and rainfall patterns present stressful conditions of increased magnitude compared to what the species faced. 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 Bartram's stonecrop would be able to shift its range naturally to keep up with current and high projected rates of climate change due to its overall population decline and inability to maintain current populations. Because plants are not mobile, expanding the distribution of this species is dependent on seed dispersal. Bartram's stonecrop seeds are small and limited in dispersal ability (Ferguson 2020). 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. Seedling distribution studies indicate gravity is the most likely dispersal mechanism as seeds are fusiform shaped (elliptical like a football) (Ferguson 2020, pers. comm.). Further, extant populations are small, which limits 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 colonize new areas with more suitable climate conditions. Thus, localized extirpations over portions of Bartram's stonecrop's range could result.

Erosion, Sedimentation, and Burial

Bartram's stonecrop typically occurs on steep slopes with erodible soils and in 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 the burial of individual plants, loss of soil where the plant is rooted, or dislodgment of 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). Soil disturbance and erosion within or above Bartram's stonecrop habitat may occur from a variety of activities, including livestock and wildlife movement; the placement and maintenance of infrastructure, trails, and roads; and recreationists or other individuals 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 also occur due to the placement of mineral extraction sites and debris piles. 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 other individuals 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). Populations may be particularly impacted during periods of unusual recreational use. We considered trampling as a stressor in our analysis of future viability only when it may impact a population with fewer than 50 individuals, as more minor stressors are exacerbated in small populations.

Illegal Collection

The illegal collection of succulents is known to occur, and is often difficult to detect. Illegal collection of Bartram's stonecrop individuals has been reported, and the effect of collection is more pronounced in small populations. More than half (58 percent) of Bartram's stonecrop populations contain fewer than 50 individuals. The lifespan of Bartram's stonecrop plants has been estimated at 5–10 years, allowing sufficient time for discovery and collection.

Bartram's stonecrop is an attractive and small plant not available from nurseries that can be easily collected by gardeners and succulent enthusiasts. This stressor was first noted in 1982, when exact localities were excluded from a summary report due to the possibility of illegal collection. Tagged

individuals were uprooted and taken from two sites in the Santa Rita Mountains in 1997–1998. Plants in close proximity to trails have higher discovery potential and are therefore more likely to be collected. Collectors advertise in internet forums seeking Bartram's stonecrop seedlings or rooted cuttings. The similar southern Arizona species, *Graptopetalum rusbyi* (San Francisco leatherpetal), is cultivated and legally available for sale from plant nurseries. However, Bartram's stonecrop is more difficult to propagate and maintain in captivity and is therefore vulnerable to collection from the wild because collectors cannot find them for purchase in nurseries. Small populations may not be able to recover from collection, especially if mature, reproductive Bartram's stonecrop individuals are removed. The removal of mature plants reduces the overall reproductive effort of the population, thereby reducing the overall resilience of the population. While documented instances of collection are limited, the impacts from collection can be profound for small populations.

Small Populations

Small population size affects Bartram's stonecrop population resiliency, as all stressors are exacerbated in populations with only a small number of individuals (fewer than 50). 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. Twenty-nine of the 50 extant Bartram's stonecrop populations in the United States contain fewer than 50 individuals. Losses due to mining, erosion, trampling, collection, herbivory, fire, severe frost, or other stressors mentioned above are exacerbated in small populations and 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; herbivory of Bartram's stonecrop individuals 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 altered precipitation, nonnative grasses, drought, and increased temperatures cumulatively and cyclically impact Bartram's stonecrop, and all stressors are exacerbated in small populations.

Population Resiliency of Bartram's Stonecrop

To 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 Bartram's stonecrop needs for long-term viability revealed a number of stressors influencing this species. Four Bartram's stonecrop populations contain nonnative grasses, and nonnative grasses are present upslope from several additional populations. Further, altered fire regimes have the potential to affect all Bartram's stonecrop populations. This altered fire regime enhances the spread of nonnatives. Consequently, all Bartram's stonecrop populations will be further impacted by nonnative grasses in the future. Altered precipitation, increased temperatures, increased evapotranspiration, decreased soil moisture, and decreased winter and spring precipitation are current and ongoing environmental conditions impacting all populations of Bartram's stonecrop and exacerbating an altered fire regime.

Many currently undeveloped areas of locatable mineral deposits may be explored or mined in the future. We do not know the full extent of future mine activity within Bartram's stonecrop's range; however, 12 mining projects are currently ongoing or proposed within 8 kilometers (5 miles) of Bartram's stonecrop populations in Arizona. The range of current and projected mining activities varies from 1 to 10 per mountain range with Bartram's stonecrop occurrences (USFS 2012, entire). One population, Sycamore Canyon (115 adult individuals in 2016), would be affected by groundwater drawdown due to the Rosemont Mine. Sycamore Canyon currently exhibits high resiliency. Further, this species is illegally 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, over half of extant Bartram's stonecrop populations are small; therefore, loss due to erosion, trampling, collection, herbivory, fire, severe frost, or other stressors have the potential to seriously damage or completely remove these small populations.

Resiliency categories of low, moderate, and high are characterized by relative levels of abundance, number of subpopulations and the spatial distribution of groups, seed production, recruitment, and extent of suitable habitat. The categories of conditions used to determine population resiliency are further described in the SSA report (Service 2020a, table 5.12) and the proposed listing rule (84 FR 67060, December 6, 2019, p. 84 FR 67069). Of the 50 extant populations, 2 populations (4 percent) exhibit high resiliency (also described as high condition), 40 populations (80 percent) are in moderate condition, and 8 populations (16 percent) are in low condition. Many small populations exhibit moderate resiliency due to other demographic and habitat factors considered in the analysis of resiliency including number of subpopulations, recruitment, riparian elements, precipitation, and shade. Thus, the resiliency analysis of a population with a low abundance score and high scores in several or all the other categories of resiliency factors may result in an averaged score in the moderate resiliency category. The current resiliency of the known Bartram's stonecrop populations is shown in table 1.

TABLE 1—BARTRAM'S STONECROP CURRENT POPULATION RESILIENCY

Sky island	Population	Number of individuals	Current resiliency
Baboquivari	Brown Canyon	115	Moderate.
	Sabino Wash	3	Low.
	Thomas Canyon	10	Moderate.
Chiricahua	Echo Canyon	186	Moderate.

TABLE 1—BARTRAM'S STONECROP CURRENT POPULATION RESILIENCY—Continued

Sky island	Population	Number of individuals	Current resiliency
	Indian Creek	0	Extirpated.
Dragoon	Carlink Canyon	0	Extirpated.
	Jordan Canyon	415	Moderate.
	Sheephead	45	Moderate.
	Slavin Gulch	9	Moderate.
	Stronghold Canyon East	388	Moderate.
	Stronghold Canyon West	557	High.
Empire	Empire Mountains	0	Extirpated.
Mule	Juniper Flat	798	Moderate.
Pajarito-Atascosa	Alamo Canyon	134	Moderate.
	Holden Canyon	9	Low.
	Sycamore Canyon	313	High.
	Warsaw Canyon	13	Moderate.
Patagonia	Alum Gulch	52	Moderate.
	Flux Canyon	123	Moderate.
Rincon	Bear Creek	171	Moderate.
	Chimenea-Madrona Canyon	29	Low.
	Chimenea Canyon Side Branch	35	Moderate.
	Distillery	3	Moderate.
	Happy Valley North	1	Low.
	Happy Valley South	41	Moderate.
	Italian Spring Canyon	30	Moderate.
	North Branch Turkey Creek	11	Moderate.
	Posta Quemada	3	Moderate.
	Rincon Creek	38	Moderate.
	Rincon Peak	2	Moderate.
	Shaw Canyon	19	Moderate.
	South Branch Turkey Creek	7	Moderate.
	Tanque Verde Ridge Trail	90	Moderate.
	Tres Pipas Canyon	4	Moderate.
	West Branch Deer Creek	10	Moderate.
Santa Rita	Adobe Canyon	82	Moderate.
	Bond Canyon	51	Moderate.
	Cave Canyon	50	Moderate.
	Gardner Canyon East	10	Moderate.
	Gardner Canyon West	14	Moderate.
	Josephine Canyon	76	Moderate.
	Madera Canyon	145	Moderate.
	Sawmill Canyon	36	Moderate.
	Squaw Gulch	55	Moderate.
	Sycamore Canyon	115	Moderate.
	Temporal Gulch	27	Moderate.
	Walker Canyon	19	Moderate.
Whetstone	Deathtrap Canyon	135	Moderate.
	French Joe Canyon	87	Low.
	Guindani Canyon	3	Moderate.
Sierra Las Avispas, Sonora	Sierra Las Avispas	2	Low.
Sierra La Escuadra, Chihuahua	Near Colonia Pacheco	46	Low.
Sierra La Estancia, Chihuahua	Cuarenta Casas	10	Low.

Bartram's Stonecrop Representation

No genetic studies have been conducted within or among the 53 Bartram's stonecrop historical populations in southern Arizona and Mexico. Mountain ranges that have only one or two populations, or have only 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. Some genetic exchange likely occurs within populations containing many subpopulations, groups, or in populations with high abundance.

However, Bartram's stonecrop may exhibit some level of genetic diversity in response to elevational and other environmental variation between locations. The species occurs on multiple substrate types and at a range of elevations (3,500 to 6,800 feet), providing potential for local adaptation and genetic differentiation among populations. This range in elevation provides a variety of climatic conditions for the species to inhabit. Due to the loss of four populations, it is possible that there has been a loss of genetic diversity.

In three populations, plants have been reported over many decades, indicating that these populations may have the genetic and environmental diversity to adapt to changing conditions. The species currently occurs across 50 populations in 12 mountain ranges; therefore, we expect some level of genetic diversity exists among mountain ranges.

Bartram's Stonecrop Redundancy

Bartram's stonecrop populations in the United States and Mexico are naturally fragmented between mountain ranges. Currently, 50 extant Bartram's stonecrop populations are spread across

12 different mountain ranges in southern Arizona and northern Mexico. Although this may imply some level of redundancy across the range of Bartram's stonecrop, 43 of the 50 extant populations contain fewer than 150 total individual plants. Further, 29 populations have 50 individuals or fewer, and 3 populations have been extirpated over recent (approximately 10) years. Given the distance of the mountain ranges with Bartram's stonecrop populations from each other, natural gene exchange or re-establishment following extirpation of populations within a mountain range is unlikely. In addition, the Mule Mountains contain a large number of Bartram's stonecrop individuals, but are represented by a single population approximately 38 kilometers (23.6 miles) away from the nearest population, making natural re-establishment of populations unlikely.

Future Condition of Bartram's Stonecrop

We used the best available information to forecast the future viability of Bartram's stonecrop. Maintaining multiple resilient populations over time (viability) depends on moisture in the microenvironment maintained by shade from overstory vegetation, spring and winter precipitation, proximity to water, and vegetation litter. We expect all extant Bartram's stonecrop populations to experience changes to these habitat characteristics to varying degrees. In addition, direct impacts to Bartram's stonecrop through being dislodged, buried, or collected will continue to impact the species.

We note that, by using the SSA framework to guide our analysis of the scientific information documented in the SSA report, we have not only analyzed individual effects on the species, but we have also analyzed their potential cumulative effects. We incorporate the cumulative effects into our SSA analysis when we characterize the current and future condition of the species. Our assessment of the current and future conditions encompasses and incorporates the threats individually and cumulatively. Our current and future condition assessment is iterative because it accumulates and evaluates the effects of all the factors that may be influencing the species, including threats and conservation efforts. Because the SSA framework considers not just the presence of the factors, but to what degree they collectively influence risk to the entire species, our assessment integrates the cumulative effects of the factors and replaces a standalone cumulative effects analysis.

Acknowledging inherent uncertainties 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 2020a, pp. 104–124). The scenarios span a range of potential stressors that are occurring or will occur in the future that will influence the future status of the species and the effects of those stressors on the species. We analyzed future projections in 10-year and 40-year timeframes because this is within the range of predictions of available hydrological and climate change model forecasts and is within the period of the Rosemont Mine effects. Forty years represents eight generations of Bartram's stonecrop, which allows us to assess reproductive effects on the species and allows populations to have opportunities to rebound. The 10-year time step also represents a reasonable timeframe to judge the species' short-term vulnerability to stressors at the current level, without projecting changes to stressors that longer timeframes would provide. Thus, the future scenarios forecast the viability of Bartram's stonecrop over the next 40 years. The following stressors were considered at different levels of impact for each scenario:

- Mining activity—water extraction, excavation, burial, shade reduction;
- Altered fire regime—lightning, recreation, cross-border human activity, nonnative plants;
- Climate effects (water)—reduction in available water including precipitation, soil moisture, humidity, surface water, aquifer recharge, reduction in riparian vegetation, increased number of days without water;
- Climate effects (other)—dislodging from flooding events, seedling desiccation, flowering halt, shade removed; and
- Effects to individual plants (applied to populations with fewer than 50 individuals)—recreation, collection, trampling, livestock or wildlife grazing and herbivory.

The levels of stressors assessed in each scenario are described in greater detail in chapter 6 of the SSA report (Service 2020a, pp. 104–124).

The first scenario (''continuation'') evaluates the condition of Bartram's stonecrop if impacts from drought, climate change, and other stressors continue as in the near past, while the other scenarios evaluate the response of the species to changes in those risks. Scenario 1 is evaluated at the 10-year time step. The second scenario (''conservation'') assumes impacts from drought, climate change, and other stressors continue as in the near past and also takes into account realistically possible additional protective measures, which may or may not happen. Scenarios 2, 3, and 4 are evaluated at the 40-year time step. The third scenario (''moderate effects'') assesses an increase in stressors to populations with changes in climate as projected in a lower (RCP 4.5) emissions scenario along with increases in other stressors. The final scenario (''major effects'') assesses a further increase in stressors to populations, with changes in climate projected at a higher (RCP 8.5) emissions scenario, and with additional increases in other stressors. These scenarios are described in more detail in chapter 6 of the SSA report (Service 2020a).

In scenario 1, we assess impacts to Bartram's stonecrop from drought, climate change, and other stressors that continue as in the near past. Based on climate change projections, emissions will continue at the same rate as the near past, resulting in continued impacts to the species. In this scenario, we expect the viability of Bartram's stonecrop to be characterized by a loss of resiliency, representation, and redundancy from the current levels. At the 10-year time step, no populations would exhibit high resiliency, 9 populations would exhibit moderate resiliency, 41 populations would exhibit low resiliency and be more susceptible to loss, and no additional populations would be extirpated.

In scenario 2, we assess impacts to Bartram's stonecrop from drought, climate change, and other stressors that continue as in scenario 1 but with conservation measures implemented that provide a benefit to the species (*e.g.,* nonnative control, forest thinning, and prevention of human-caused wildfire). Climate change impacts are projected to continue at the current rate, and no conservation measures address drying of habitat. In this scenario, we expect the viability of Bartram's stonecrop to be characterized by similar levels of representation and redundancy and slightly lower levels of resiliency than it exhibits under the current condition. Because current stressors remain in place, conservation measures improve the resiliency of populations, but this effect is overshadowed by the impact of continued climate change and drought at the current level.

The third scenario assesses ''moderate effects'' to Bartram's stonecrop with impacts to the species evaluated at the

40-year time step. Under this scenario, water flow reduction due to drought and groundwater extraction continues to reduce the humid microhabitat for this species. Cross-border 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, herbivory, and human impacts also continue at current or increased levels.

Under this 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 are already reduced as described above. In 40 years, we expect that none of the 50 extant populations would exhibit high resiliency, 2 populations would exhibit moderate resiliency, 35 populations would exhibit low resiliency, and 13 additional populations would be extirpated, further reducing species redundancy and representation (table 2, below; see table 6.6 in the SSA report (Service 2020a)). Under the moderate effects scenario, because of stressors described above, 45 populations would be reduced from their current condition (for population level projections, see figure 6.3 and table 6.6 in the SSA report (Service 2020a)). In this scenario, two of the three small populations in Mexico will be extirpated due to the amount of nonnatives contributing to fire, reduction in precipitation, increase in drought, and low resiliency of a small population.

Under scenario 4, ''major effects'', we expect the viability of Bartram's stonecrop to be characterized by lower levels of resiliency, representation, and redundancy than under scenario 3. At the 40-year time step, no populations exhibit high resiliency, one would exhibit moderate resiliency, 16 would exhibit low resiliency, and 36 populations would be extirpated, further reducing redundancy and connectivity.

Please refer to the SSA report (Service 2020a, entire) for a more detailed discussion of our evaluation of the biological status of Bartram's stonecrop, the influences that may affect its continued existence, and the modeling efforts undertaken to further inform our analysis.

TABLE 2—BARTRAM'S STONECROP POPULATION CURRENT AND FUTURE RESILIENCY

Mountain range	Population name	Current condition	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Baboquivari	Brown Canyon	Moderate	Moderate	Moderate	Moderate	Low.
	Sabino Wash	Low	Low	Low	Low	Extirpated.
	Thomas Canyon	Moderate	Low	Low	Low	Low.
Chiricahua	Echo Canyon	Moderate	Moderate	Moderate	Low	Low.
	Indian Creek	Extirpated	Extirpated	Extirpated	Extirpated	Extirpated.
Dragoon	Carlink Canyon	Extirpated	Extirpated	Extirpated	Extirpated	Extirpated.
	Jordan Canyon	Moderate	Moderate	Moderate	Low	Low.
	Sheephead	Moderate	Low	Low	Low	Low.
	Slavin Gulch	Moderate	Low	Low	Low	Extirpated.
	Stronghold Canyon E.	Moderate	Moderate	Moderate	Low	Low.
	Stronghold Canyon W	High	Moderate	Moderate	Moderate	Moderate.
Empire	Empire Mts	Extirpated	Extirpated	Extirpated	Extirpated	Extirpated.
Mule	Juniper Flat	Moderate	Low	Moderate	Low	Low.
Pajarito-Atascosa	Alamo Canyon	Moderate	Low	Low	Low	Low.
	Holden Canyon	Low	Low	Low	Extirpated	Extirpated.
	Sycamore Canyon	High	Moderate	Moderate	Low	Low.
	Warsaw Canyon	Moderate	Low	Low	Extirpated	Extirpated.
Patagonia	Alum Canyon	Moderate	Low	Low	Extirpated	Extirpated.
	Flux Canyon	Moderate	Low	Low	Extirpated	Extirpated.
Rincon	Bear Creek	Moderate	Moderate	Moderate	Low	Low.
	Chimenea-Madrona Canyon	Low	Low	Low	Low	Extirpated.
	Chimenea Canyon Side Branch.	Moderate	Low	Moderate	Low	Extirpated.
	Distillery Canyon	Moderate	Low	Moderate	Extirpated	Extirpated.
	Happy Valley North	Low	Low	Low	Extirpated	Extirpated.
	Happy Valley South	Moderate	Low	Moderate	Low	Extirpated.
	Italian Spring Canyon	Moderate	Low	Low	Low	Extirpated.
	North Branch Turkey Creek	Moderate	Low	Low	Low	Extirpated.
	Posta Quemada Canyon	Moderate	Low	Moderate	Low	Extirpated.
	Rincon Creek	Moderate	Low	Low	Low	Extirpated.
	Rincon Peak	Moderate	Low	Low	Low	Extirpated.
	Shaw Canyon	Moderate	Low	Moderate	Extirpated	Extirpated.
	South Branch Turkey Creek	Moderate	Low	Low	Low	Extirpated.
	Tanque Verde Ridge Trail	Moderate	Moderate	Moderate	Low	Low.
	Tres Pipas Canyon	Moderate	Low	Low	Low	Extirpated.
	West Branch Deer Creek	Moderate	Low	Low	Low	Extirpated.
Santa Rita	Adobe Canyon	Moderate	Low	Low	Low	Extirpated.
	Bond Canyon	Moderate	Low	Low	Low	Extirpated.
	Cave Canyon	Moderate	Low	Low	Extirpated	Extirpated.
	Gardner Canyon East	Moderate	Low	Low	Extirpated	Extirpated.
	Gardner Canyon West	Moderate	Low	Low	Low	Extirpated.
	Josephine Canyon	Moderate	Moderate	Moderate	Low	Low.
	Madera Canyon	Moderate	Low	Low	Low	Low.
	Sawmill Canyon	Moderate	Low	Low	Extirpated	Extirpated.
	Squaw Gulch	Moderate	Low	Low	Low	Extirpated.
	Sycamore Canyon	Moderate	Low	Low	Extirpated	Extirpated.
	Temporal Gulch	Moderate	Low	Low	Low	Low.
	Walker Canyon	Moderate	Low	Low	Low	Extirpated.
Whetstone	Deathtrap Canyon	Moderate	Low	Low	Low	Low.
	French Joe Canyon	Low	Low	Low	Low	Extirpated.
	Guindani Canyon	Moderate	Low	Low	Low	Extirpated.
Sierra Las Avispas, Sonora	Sierra Las Avispas	Low	Low	Low	Extirpated	Extirpated.

TABLE 2—BARTRAM'S STONECROP POPULATION CURRENT AND FUTURE RESILIENCY—Continued

Mountain range	Population name	Current condition	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Sierra La Escuadra, Chihuahua.	Near Colonia Pacheco	Low	Low	Low	Low	Low.
Sierra La Estancia, Chihuahua.	Cuarenta Casas	Low	Low	Low	Extirpated	Extirpated.

Summary of Comments and Recommendations

In our December 6, 2019, proposed rule (84 FR 67060), we requested that all interested parties submit written comments on the proposal by February 4, 2020. We also contacted appropriate Federal and State agencies, scientific experts and organizations, and other interested parties and invited them to comment on the proposed rule. Newspaper notices inviting general public comment were published in the Arizona Daily Star on December 9, 2019, and the Sierra Vista Herald on December 13, 2019. We did not receive any requests for a public hearing. All substantive information provided during the comment period either has been incorporated directly into the final rule or is addressed below.

Peer Reviewer Comments

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), and our August 22, 2016, memorandum updating and clarifying the role of peer review of listing actions under the Act, we sought the expert opinions of three appropriate specialists regarding the 2018 SSA report. The peer reviewers have expertise that includes familiarity with Bartram's stonecrop and its habitat, biological needs, and threats. We received responses from two specialists, which informed the SSA report and proposed rule. The purpose of peer review is to ensure that our listing determinations and 4(d) rules are based on scientifically sound data, conclusions, and analyses.

In the development of the final rule, we solicited further expert opinion on stressors and the effect of stressors as analyzed in the SSA from six knowledgeable specialists with scientific expertise that included familiarity with Bartram's stonecrop and its habitat, biological needs, and threats (Service 2020b, entire). We reviewed all comments we received from the specialists for substantive issues and new information regarding Bartram's stonecrop. The reviewers generally concurred with our methods and conclusions, and provided additional information, clarifications, and suggestions to improve the updated SSA report and final rule. Peer reviewer comments and expert opinions are incorporated into the SSA report (Service 2020a) and this final rule as appropriate.

Public Comments

We received 17 public comments in response to the proposed rule. We reviewed all comments we received during the public comment period for substantive issues and new information regarding the proposed rule. Seven commenters provided substantive comments or new information concerning the proposed listing and 4(d) rule for Bartram's stonecrop. Below, we provide a summary of the substantive issues raised in the public comments we received; however, comments outside the scope of the proposed rule, and those without supporting information, did not warrant an explicit response and, thus, are not presented here. Identical or similar comments have been consolidated and a single response provided.

(1) *Comment:* A commenter indicated that the Service did not notify the public of the imminent listing of the species and the public needs more time to respond.

Response: On August 8, 2012, we announced our 90-day finding that a petition to list Bartram's stonecrop as endangered or threatened under the Act presented substantial information indicating that listing of the species may be warranted (77 FR 47352). At that time, we requested data or other information from the public regarding the species to inform our status review and determination if listing is warranted. In response to publication of the 90-day finding, increased interest in Bartram's stonecrop and its status led to additional surveys and research beginning in 2013. On October 23, 2017, we sent a letter to interested parties, landowners, and Tribes indicating that an SSA would be conducted for Bartram's stonecrop to inform our listing determination, and we again requested scientific and commercial data or other information on the species.

In addition, the species has been included on our National Listing, which is publicly available on our website, since 2016. We updated the workplan in May 2019 and listed the 12-month finding for Bartram's stonecrop as a FY 2018 carryover action. The court-ordered settlement agreement of October 11, 2019, that stipulates delivery of a 12-month finding to the **Federal Register** by November 29, 2019, is also publicly available.

Finally, the December 6, 2019, proposed rule (84 FR 67060) opened a 60-day public comment period on the proposed listing and proposed 4(d) rule for Bartram's stonecrop.

As such, we complied with all requirements of the Act and conclude that the public was afforded adequate notice of the proposed listing of Bartram's stonecrop.

(2) *Comment:* Three commenters stated that relying on the conservation biology concepts of resiliency, redundancy, and representation to make the proposed listing determination is improper, as they are not found in the Act or the Service's implementing regulations and their meanings are uncertain, creating confusion if criteria for listing are being followed.

Response: The SSA framework is an analytical approach developed by the Service to deliver foundational science for informing decisions under the Act (Smith *et al.* 2018, entire). The SSA characterizes species viability (defined as the ability to sustain populations in the wild over time) based on the best scientific understanding of current and future abundance and distribution within the species' ecological settings using the conservation biology principles of resiliency, redundancy, and representation (Shaffer and Stein 2000, pp. 308–311). To sustain populations over time, a species must have the capacity to withstand: (1) Environmental and demographic stochasticity and disturbances (resiliency), (2) catastrophes (redundancy), and (3) novel changes in its biological and physical environment (representation). A species with a high degree of resiliency, representation, and redundancy is better able to adapt to novel changes and to tolerate environmental stochasticity and catastrophes. In general, species viability will increase and the risk of extinction will decrease with increases in resiliency, redundancy, and

representation (Smith *et al.* 2018, p. 306). The SSA provides decision-makers with a scientifically rigorous characterization of a species' status and the likelihood that the species will sustain populations over time, along with key uncertainties in that characterization. The Bartram's stonecrop SSA provides the best scientific information available to guide a determination of whether or not Bartram's stonecrop is in danger of extinction now or in the foreseeable future.

Notwithstanding our use of resiliency, redundancy, and representation as scientific concepts helpful in assessing and describing a species' viability and extinction risk, we adhere to all requirements of the Act in making our listing determinations. This includes applying the Act's definitions of an endangered species and a threatened species, as well as an assessment of the 5 listing factors (see *Regulatory Framework,* below).

(3) *Comment:* Three commenters suggested the Service's discussion of its proposed 4(d) rule for Bartram's stonecrop conflicts with the Act and erroneously extends the ''take'' prohibition for fish and wildlife to a plant species.

Response: The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to endangered plants. The prohibitions of section 9(a)(2) of the Act, codified at 50 CFR 17.61, make it illegal for any person subject to the jurisdiction of the United States to: Import or export; remove and reduce to possession from areas under Federal jurisdiction; maliciously damage or destroy on any such area; remove, cut, dig up, or damage or destroy 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; deliver, receive, carry, transport, or ship in interstate or foreign commerce, by any means whatsoever and in the course of a commercial activity; or sell or offer for sale in interstate or foreign commerce an endangered plant. Certain exceptions apply to employees of the Service, the National Marine Fisheries Service, other Federal land management agencies, and State conservation agencies.

The final 4(d) rule for Bartram's stonecrop provides for the conservation of the species by applying all of the prohibitions listed in section 9(a)(2) of the Act and 50 CFR 17.61 that are applicable to an endangered plant, except as otherwise authorized or permitted at 50 CFR 17.61(c)(2) and (3), 50 CFR 17.71(b), and 50 CFR 17.72.

In the December 6, 2019, proposed rule (84 FR 67060, p. 84 FR 67086), we also describe a range of activities that have potential to impact Bartram's stonecrop, including:

- Unauthorized handling or collecting of the species;
- Ground-disturbing activities where the species occurs;
- Activities that would affect pollinators where the species occurs and in the surrounding area;
- Activities that would promote high-severity wildfires where the species occurs;
- Activities that would reduce shade, reduce proximity to water, and lower the water table such that the cooler, humid microenvironment is affected; and
- Herbicide applications where the species occurs.

These activities are provided as examples of actions that may affect Bartram's stonecrop, and as such would be subject to section 7 consultation for projects with a Federal nexus, and are not intended to be a list of prohibitions under the final 4(d) rule for Bartram's stonecrop.

(4) *Comment:* Several commenters stated that Service botanists have not visited sites with Bartram's stonecrop and that if more surveys are done, more plants will be found as Bartram's stonecrop is a small cactus with one-inch flowers that are hard to see. For example, the species has been discovered at 16 new locations since 2015.

Response: Bartram's stonecrop is a succulent with specific habitat requirements and is detectable in bloom and out of bloom by trained botanists. All researchers involved with Bartram's stonecrop surveys, including the Service, the National Park Service (NPS), the U.S. Forest Service (USFS), and the Arizona Game and Fish Department, as well as other academic and commercial entities, are experienced in both plant and habitat identification. Increased survey efforts since 2013 by such qualified individuals have led to newly discovered Bartram's stonecrop populations or groups. We are aware of 70 total elemental occurrences (Arizona Game and Fish Department, Heritage Database Management System) in the 50 extant U.S. Bartram's stonecrop populations. Of these, all but seven occurrences from five populations have been located or revisited since 2010 (Service 2020a, tables 5.2–5.11).

Following extensive survey efforts in Arizona and Mexico, we are now aware of 872 new individuals from the United States and Mexico since the SSA report was initially written (Service 2020a, entire). For example, between 2018 and 2020, numerous surveys for Bartram's stonecrop were conducted in the Rincon Mountains, and 13 additional Bartram's stonecrop populations were located (Service 2020a, pp. 89–90), including 1 population previously considered to be extirpated that contained one individual in 2019 (Service 2020a, p. 15). Similarly, recent surveys in the Santa Rita Mountains resulted in a newly discovered group of 55 individuals in Madera Canyon. We are also now aware of additional information from a private researcher's surveys beginning in 2012. We have incorporated this and all verified information regarding species occurrences in the revised SSA report (version 2.0) and this final rule. Although the newly discovered individuals contribute to the overall abundance of Bartram's stonecrop and may increase the resiliency of some populations, the threats to the species and the effect of those threats on the species remain such that the species is likely to become in danger of extinction within the foreseeable future. This additional information did not alter our conclusion that the species meets the Act's definition of a threatened species.

(5) *Comment:* Four commenters felt that there is not enough evidence to conclude that Bartram's stonecrop populations are declining. Specifically, the Mule Mountains population has increased in size to 798 individuals and the statement in the proposed rule that there has been a contraction in size is outdated.

Response: The 2015 survey of the Mule Mountains Juniper Flat population noted 798 individuals. This information is included in the SSA report (Service 2018, pp. 50, 71, 79, 80; Service 2020a, pp. 52, 72, 80, 81) and December 6, 2019, proposed rule (84 FR 67060). Extensive efforts during the 2015 survey located a larger group of plants within the known population. The newly discovered group of 798 plants is located approximately 300 meters from a southernmost group removed in a scouring flood and subsequent drying of the habitat. Therefore, if the larger group of Bartram's stonecrop plants co-occurred with the smaller group, but was not observed, then the overall Juniper Flat population has contracted with the loss of the smaller group. No additional surveys or observed occurrences in the Mule Mountains have been reported to the Service since 2015.

The statement regarding a ''general state of population decline'' has been removed in this final rule as we acknowledge that populations fluctuate over time. However, we do not expect

populations extirpated due to drying of habitat to rebound over time as suitable habitat conditions would not be present. Specifically, drying of habitat has been linked to decreased abundance and extirpation of populations in the Chiricahua, Dragoon, Empire, Santa Rita, and Rincon mountains, including a group of plants from the largest population at Juniper Flat. In three of these instances, extirpation was associated with the drying of habitat, which rendered it no longer suitable for the species.

(6) *Comment:* Two commenters suggested that the moist canyons where Bartram's stonecrop have been found are associated with the attraction of the public and botanists to these locations, and that survey bias and poor detectability can result in the mischaracterization of Bartram's stonecrop habitat. Several commenters questioned the characterization of Bartram's stonecrop's habitat needs with respect to moisture and proximity to water.

Response: The Service completed a robust SSA based on the best available scientific and commercial information. Bartram's stonecrop is a species found in Madrean woodlands, and does not appear to be a riparian species dependent on shallow ground water. The best available information on Bartram's stonecrop indicates the species occurs near water sources (springs, seeps, or intermittent streams), which may provide humidity and create suitable microclimate conditions. The deep, narrow canyons and associated overstory species provide shade during a portion of the day and create a cooler temperature, and the vegetation litter promotes retention of soil moisture and contributes to the humid microenvironment. Of 56 extant Bartram's stonecrop subpopulations with microhabitat condition documented, 78.6 percent were found within 10 meters of an intermittent or perennial streambed, an additional 14.3 percent were found between 11 and 20 meters from an intermittent or perennial streambed, and 7.1 percent were located more than 20 meters from an intermittent or perennial streambed. Researchers searched for plants at varying distances from streambeds, but note most plants were found nearer streambeds. In general, botanists visit many different habitat types in southern Arizona, and few Bartram's stonecrop individuals have been located outside of habitats with relatively humid microhabitat conditions, as described in the SSA report (Service 2020a, pp. 18, 24).

(7) *Comment:* A commenter notes that other Bartram's stonecrop populations are being discovered, and at least one of the presumed extirpated populations (Rincon North) cannot really be determined to be gone.

Response: The discovery of 872 additional individuals and new groups of plants in Arizona and Mexico, as described in our response to *Comment* (4), above, represent substantial survey effort by multiple groups. The 2015 survey of the population referenced (referred to as Happy Valley North in the SSA report) did not locate any Bartram's stonecrop individuals. However, in 2019, a single plant was located within this population. We have incorporated the updated information into the revised SSA report and describe the Happy Valley North population as extant. However, we note that one individual does not indicate a robust population and consider this population to be in very poor condition.

(8) *Comment:* A commenter indicated we did not solicit information from Cecile Shohet, who conducted research on Bartram's stonecrop for a Master's of Science thesis.

Response: As required by the Act (16 U.S.C. 1533(b)(1)), we based the listing decision on the best available scientific and commercial information. We worked in partnership with numerous agencies and organizations to visit most of the known U.S. locations of Bartram's stonecrop occurrences at least once (with some long-term monitoring initiated), as well as a portion of the Mexico populations. Although information from 1983–2010 is limited, we used the best available information to assess the species' current and future conditions. The U.S. Forest Service, National Park Service, Service, industry surveyors, and other researchers gathering information on Bartram's stonecrop have increased survey efforts since 2013 in suitable habitat in Arizona and Mexico. At a minimum, recent surveys and research on Bartram's stonecrop have occurred each year from 2013 to 2020.

A solicitation for peer review of the SSA report was sent to Ms. Shohet on October 16, 2017, and no response was received. We solicited Ms. Shohet's expert opinion on specific aspects of the SSA and have incorporated all information received following the publication of the December 6, 2019, proposed rule in the revised SSA.

(9) *Comment:* Three commenters stated that there is little to no evidence that drying has contributed to the extirpation of Bartram's stonecrop populations.

Response: Bartram's stonecrop occurs only in habitat near water sources with a relatively moist and humid microenvironment and occasionally occurs in lower abundance in habitat farther away from water. As such, we determined that the humid microhabitat conditions are a need for species viability (ability to sustain populations in the wild over time). Changes to required habitat conditions, including drying, are expected to negatively affect Bartram's stonecrop populations and contribute to reductions in abundance and population extirpation. Bartram's stonecrop seedlings are particularly susceptible to desiccation, and resurveys have shown large losses in this size class.

Drying of habitat associated with population or group extirpations has been observed in the Carlink Canyon, Empire Mountains, and Mule Mountains. Extirpations occurring in drying habitat are unlikely to be recolonized since suitable conditions for Bartram's stonecrop are no longer present. When suitable habitat is lost and not restored, Bartram's stonecrop experiences an increased risk of extirpation and extinction.

(10) *Comment:* The commenters stated that several morphological and metabolic characteristics of Bartram's stonecrop are not discussed in the proposed rule despite their important role in determining the habitat requirements of Bartram's stonecrop. These characteristics include a thick waxy covering on the epidermis, Crassulacean acid metabolism that results in stomata only opening at night, a shallow root system, and succulent leaves massed together as a rosette.

Response: Crassulacean acid metabolism (CAM) plants minimize photorespiration and save water by separating the steps of carbon dioxide fixation and the Calvin cycle (used to turn carbon dioxide into sugar) in time, between day and night. Reducing photorespiration decreases wasted energy and decreases sugar synthesis. Approximately 6 percent of flowering plants are known to use CAM. CAM species vary widely in the efficacy and use of CAM, and many maintain the ability to conduct photosynthesis without reducing photorespiration during part of the day, part of the season, and/or part of their lifecycle. All or nearly all members of the nearly worldwide plant family Crassulaceae have the ability to perform CAM, and they occupy a range of microhabitats. Most taxa grow in arid habitats such as rocks and rock fissures under otherwise more humid climatic conditions, or in mountain regions in moderately arid

areas, and are largely absent from hot deserts and arid lowlands. Therefore, it is not possible to predict a plant's habitat based solely on knowing that it performs CAM.

Bartram's stonecrop exhibits morphological features characteristic of other Crasulaceae including a waxy covering of the leaves, a shallow root system, and the arrangement of the leaves in a rosette. These features are also found in succulents that occur in drier habitats and may act to promote water conservation, but do not alter the habitat requirements of Bartram's stonecrop.

(11) *Comment:* A commenter noted that hundreds of plants and animals are at the northern fringe of their range in southern Arizona and are common and safe in Mexico.

Response: Historical distributions of Bartram's stonecrop populations are focused in southern Arizona, with some disjunct populations in northern Mexico. There have been surveys for this species in Mexico, and numerous biologists from Mexico have been consulted regarding its presence in the country. Habitat has been altered extensively in Mexico, and limited populations of Bartram's stonecrop have been located there; therefore, we do not find it reasonable to conclude that the species is common or safe in Mexico.

(12) *Comment:* A commenter claimed that surveys by Sanchez-Escalante in Mexico were rushed, and occurred in the wrong habitat and at the wrong time of year.

Response: The researcher Sanchez-Escalante spent 35 days exploring 55 sites in Sonora and Chihuahua, and covered 6,900 kilometers with a team of trained botanists with the specific aim of locating populations of six identified rare plant species in appropriate habitats. Two new Bartram's stonecrop populations were located and two historical Bartram's stonecrop populations were confirmed out of 11 suitable habitat locations surveyed. These surveys were conducted during the flowering season in late September when the plants are most visible. Therefore, we concluded the Sanchez-Escalante surveys were conducted using appropriate methods. Thus, we base our current understanding of the Bartram's stonecrop occurrences in Sonora and Chihuahua on the best available scientific information.

(13) *Comment:* A commenter mentioned that regular visitation is necessary to attain information on bloom period, seed production, reproduction method, pollinators, precipitation and growth relationships, and genetic diversity.

Response: We are aware of limited information regarding the life history and species characteristics the commenter mentioned. The current knowledge of Bartram's stonecrop phenology and reproduction is described in the SSA report (Service 2020a, p. 20). The inflorescence stalks of Bartram's stonecrop individuals grow for 30–40 days in July and August before coming to their full height, with flowers opening primarily between September and November (Kearney and Peebles 1951, p. 361; Phillips *et al.* 1982, pp. 2, 7; Shohet 1999, p. 25). Flowering is triggered by fall rains and does not occur during periods of water stress (Shohet 1999 pp. 22, 25, 36, 39). Seed dispersal occurs from November to December.

Bartram's stonecrop requires pollinators for reproduction. The major pollinators of Bartram's stonecrop are true flies and house flies, although honey bees may also play a role in pollination. Other species that have been noted on Bartram's stonecrop include wasps, butterflies, and bee 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, although having a long period of flowering increases overall chance of pollination (Shohet 1999, p. 57).

The full relationship between precipitation and plant growth in each life stage has not been fully elucidated. However, winter precipitation is needed for germination, although some germination likely occurs following summer rains. Summer (July and August) and fall (October and November) precipitation is needed for flower production. We are supporting current research into the specific microhabitat requirements for Bartram's stonecrop including site characteristics of overstory vegetation, associated plant species, substrate characteristics, litter depth and character, local insolation and shade, soil temperature and soil moisture, and distance to perennial water. These studies will provide information on temperature and humidity parameters throughout the flowering, germination, and early seedling growth of the plants. Further studies will inform conservation and recovery efforts for the species.

(14) *Comment:* A commenter claimed the Service did not do due diligence to list threats or make determinations, but used the petitioner's list of threats. Three commenters also opined that the Service's analysis of stressors and classification of the current condition is speculative and not based on hard data.

Response: The Service's determination to list the species is based on a thorough, scientific analysis that was subject to appropriate peer review. Although there are threats noted in common between the Bartram's stonecrop SSA report and the petition to list the species (CBD 2010), there are also differences. The petition calls out mining, livestock grazing, and recreation as the primary threats to Bartram's stonecrop. The SSA analysis determined the following primary influences on viability: Loss of water availability; erosion, sedimentation, and burial; altered fire regime; and loss of shade. We based our analyses on the best available information, which included recent studies of and surveys for Bartram's stonecrop by the National Park Service, U.S. Forest Service, the Service, and private researchers.

(15) *Comment:* A commenter claimed the Service lacks basic knowledge about the biology and habitat requirements of Bartram's stonecrop and is not following the mandate to base listing decisions on the best scientific and commercial data available.

Response: We based this final listing determination on the best available scientific and commercial information, and the commenter did not provide any new information for us to consider. The best available information on Bartram's stonecrop indicates the species occurs near water sources (springs, seeps, or intermittent streams), which may provide humidity and create suitable microclimate conditions. The deep, narrow canyons and associated overstory species provide shade during a portion of the day and create a cooler temperature, and the vegetation litter promotes retention of soil moisture and contributes to the humid microenvironment. Additional Bartram's stonecrop biology and habitat research is ongoing, and results will inform future Service actions. In assessing the viability of Bartram's stonecrop, the best available scientific and commercial data provide information about some aspects of species' biology and habitat requirements, but may not represent a full and complete knowledge of the species. We drew reasonable conclusions about other aspects of the species' biology and requirements based on similar species, similar habitats, and best available information.

(16) *Comment:* A commenter indicated that managed livestock and wild ungulate grazing reduce fuels for fires and requested all language relating to domestic livestock threatening Bartram's stonecrop be removed from the SSA report and the rule.

Response: Livestock grazing is not noted in the SSA report or the rule as a major threat to Bartram's stonecrop. Rather, the Bartram's stonecrop SSA report concluded that because Bartram's stonecrop typically occurs on steep terrain, the plants are largely protected from grazing. However, trampling may occur when cattle graze in areas where Bartram's stonecrop occurs. Mortality may be caused by direct trampling by livestock (Searle and Meyer 2020, p. 6), and dislodging of soils by the hard edges of hooves may lead to increased erosion or burial of nearby plants, affecting Bartram's stonecrop individuals in areas with livestock grazing pressure. Therefore, while grazing is not a major threat to the species, trampling and direct mortality act as stressors to Bartram's stonecrop in some circumstances, and the effect of livestock is analyzed in the SSA report.

(17) *Comment:* A commenter suggested using past climate data at a local level rather than modelling projections when discussing climate as a threat.

Response: In the Bartram's stonecrop SSA report, figures 4.11a–c show both the past and projected mean daily maximum temperatures in Cochise, Pima, and Santa Cruz Counties, Arizona (Service 2020a, pp. 63–67). The data for past mean daily maximum temperatures also indicate increases in temperature in all three counties. Modelling projections based on the Intergovernmental Panel on Climate Change Fifth Assessment report (IPCC 2014, entire) and future climate projections from the National Climate Explorer Tool (USGS 2017a, entire) downscaled to county level were used to discuss climate change and the effects of current and future changes on Bartram's stonecrop. Section 4.3 of the SSA (USFWS 2020, pp. 37–51) describes these modelling projections in greater detail.

(18) *Comment:* A commenter stated that demographic and environmental stochasticity are naturally occurring phenomena for which Bartram's stonecrop plants are very well adapted.

Response: Demographic and environmental stochasticity are naturally occurring phenomena (Shaffer 1981, p. 131). However, Bartram's stonecrop populations adapted to naturally occurring phenomena now experience the additional stressors related to a changing fire regime, nonnative species, and the effects of a changing climate beyond the scope of normal occurrence. For example, effects due to a changing climate, coupled with other stressors, can have a cumulative impact resulting in greater than anticipated decline in rare species (Souther and McGraw 2014, pp. 1471–1472). In addition, populations that experience variability in abundance must maintain a minimum viable population to be able to repopulate after a demographic or environmental stochastic event or catastrophe (Holsinger and Falk 1991, p. 45). Following a stochastic event that extirpates a population, suitable habitat for Bartram's stonecrop must be present, including humidity and shade, to provide conditions for potential recolonization or regrowth. Rangewide (including Mexico), 29 of the 50 Bartram's stonecrop populations (58 percent) are small (fewer than 50 individuals). When the effect of small population size exacerbates other stressors beyond those naturally occurring phenomena that Bartram's stonecrop has adapted to, population abundance may be reduced to the extent that repopulation does not occur.

(19) *Comment:* Three commenters stated the analysis of mining as a threat is cursory, unsupported, and overstates the likelihood of mining projects occurring within the range of the species. They noted that no mining projects outside of Rosemont are specifically identified and that the Service used an outdated 2012 document/map for this discussion. The commenters also stated that there is no evidence that loss of water from mining operations is a significant threat to Bartram's stonecrop and noted that the shade trees associated with Bartram's stonecrop habitat do not rely on groundwater. Therefore, the proposed rule overstated water drawdown from mining as a threat.

Response: Mining is expected to affect Bartram's stonecrop individuals and populations in several ways. The direct removal of Bartram's stonecrop individuals due to erosion or burial from mineral extraction sites, test pits, and debris piles is expected to impact small populations. Fragmentation of Bartram's stonecrop populations due to placement of mining operations and associated activities can interfere with pollination and reproduction (Rathcke and Jules 1993, p. 276). Due to uncertainty regarding the effect of fugitive dust or heavy metal pollution generated by mining operations on Bartram's stonecrop's growth and vigor, these potential stressors were not analyzed. The primary threat to Bartram's stonecrop analyzed with regard to mining was the loss of overstory shade trees due to dewatering of nearby streams and groundwater drawdown.

Bartram's stonecrop-associated shade trees include the following riparian obligate species: *Salix* sp. (willow), *Populus* sp. (cottonwood), and *Platanus* sp. (sycamore). Within the following Bartram's stonecrop locations, the associated overstory includes riparian trees that provide between 50 and 80 percent shade to the sites: (1) Penasco Canyon: Willow; (2) Stronghold East: Ash; (3) Cave Canyon: Sycamore; (4) Josephine Canyon: Cottonwood and willow; (5) Santa Rita Sycamore Canyon: Ash; (6) Madera Canyon: Sycamore; (7) Jordan Canyon: Cottonwood, ash, and willow; (8) Warsaw/Old Glory Canyons: Willow; (9) Sawmill Canyon: Sycamore; and (10) Death Trap Canyon: Ash. Our response to *Comment* (6), above, describes the importance of riparian shade trees in maintaining the microhabitat needed by Bartram's stonecrop.

Dewatering of streams in the vicinity of mining operations may lead to overstory canopy changes and loss of shade, as well as reduction in spring and stream flow and humidity in nearby Bartram's stonecrop populations. One mine has been proposed in the Santa Rita Mountains. Bartram's stonecrop individuals and populations in the analysis area could experience indirect impacts from groundwater drawdown (USFS 2013a, p. 676). According to the Rosemont Final Environmental Impact Statement (USFS 2013a, p. 339), the proposed mine pit would create a permanent drawdown of the water table, and groundwater flowing toward the pit would 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. The Bartram's stonecrop plants growing just southwest of the proposed Rosemont Mine were analyzed in the Rosemont Final Environmental Impact Statement (USFS 2013a, pp. 346–350). The predicted groundwater drawdown in the affected population at the end of active mining is 0.1–5 feet, depending on the site assessed and the model used. At 20 years from the mine closure, the predicted drawdown increases to a maximum of 15–20 feet.

In our analysis, we describe a range of potential mining scenarios that may affect Bartram's stonecrop: (1) Ongoing mining activity, (2) one to three new mining activities across the range of the species, and (3) greater than three new mining activities across the range of the species, to represent future levels of stressors to Bartram's stonecrop from mining. We used the information from Coronado National Forest Mining Activity (USFS 2012) to develop these plausible ranges of potential activities. We are not aware of any other sources regarding potential mining activities;

however, we welcome any new information on the likelihood of mining impacts to inform subsequent Service actions.

(20) *Comment:* A commenter notes that Bartram's stonecrop rock habitat should minimize wildfire, erosion, sedimentation, and burial, and that the 12-month finding for *Hexalectris colemanii* concluded that wildfire was not a risk, yet it occurs in the same habitat as Bartram's stonecrop.

Response: The crevices in the rock habitat where Bartram's stonecrop occurs provide shade, shelter, and soil moisture retention, and they provide the plant some protection from burning due to a lack of surrounding vegetation serving as fuel for fire in the rocky terrain. However, overstory tree and shrub species that provide shade to Bartram's stonecrop plants may be impacted by fire. Due to the location of plants in crevices or shallow soil pockets in steep canyons, adherence to substrate or soil is tenuous, and plants can be easily dislodged due to post-fire flooding, foot traffic, eroding soil, or falling rocks.

Unlike Bartram's stonecrop, *Hexalectris colemanii* (Coleman's coralroot) is an almost exclusively subterranean species and is likely capable of resprouting following fire. In addition, the threats of nonnative plants (*e.g., Eragrostis lehmanniana* (Lehmann's lovegrass) and *Melinis repens* (rose natal)) were not considered to be threats to the Coleman's coralroot (78 FR 76795; December 19, 2013), but are considered to be a threat to Bartram's stonecrop. These nonnative plants increase fire risk and alter the fire regime (frequency and severity) within Bartram's stonecrop habitat.

We are aware of 11 wildfires that occurred in known Bartram's stonecrop sites from 2007–2017, killing some Bartram's stonecrop individuals and removing shade in some sites. Wildfires have burned in all nine sky island mountain ranges of southern Arizona with known Bartram's stonecrop occurrences within the last decade. Wildfire could potentially cause extirpation of small Bartram's stonecrop populations throughout the range of the species and have negative impacts on larger populations. Bartram's stonecrop seeds are very tiny, reside at or near the soil surface (Shohet 1999, p. 48), and show no characteristics that would promote survival in a wildfire.

(21) *Comment:* Three commenters stated that there is no evidence that erosion, sedimentation, or burial are significant threats to Bartram's stonecrop.

Response: Erosion, sedimentation, and burial of Bartram's stonecrop individuals may occur as a result of mining, livestock pressure, recreation trails and roads, flooding events, cross border human activity, and post-wildfire runoff. Bartram's stonecrop is found in crevices or shallow soil pockets in steep canyons where adherence to substrate or soil is necessarily tenuous. Individual plants can be easily dislodged from these positions due to flooding, foot traffic, eroding soil, or falling rocks. Individuals dislodged by erosion and covered by rock fall have been observed in the Rhyolite Canyon subpopulation (Service 2020a, p. 76). Similarly, more than a half dozen individuals dislodged from trailside infrastructure were lost to erosion in the Madera population (Shohet 1999, p. 60). The effects of erosion, sedimentation, and burial and the loss of Bartram's stonecrop individuals are exacerbated in small populations.

(22) *Comment:* Some commenters stated that fire may not be so important for this species and that an altered fire regime poses an uncertain threat to Bartram's stonecrop.

Response: The Madrean evergreen woodlands of the sky islands where Bartram's stonecrop occurs have evolved with frequent low-severity fire with an interval of 10 to 30 years between relatively widespread fires in the pine-dominant forests (Swetnam *et al.* 2010, p. 4). Due to a variety of human activities in the landscape (*e.g.,* excessive livestock grazing, fuelwood cutting, nonnative introduction and expansion, and fire suppression starting around the turn of the last century through the mid-1900s), these woodlands now have high fuel loads, and high-severity fires are becoming increasingly more common (Swetnam *et al.* 2010, p. 11; FireScape 2016, entire). There is no evidence that such large, stand-replacing fires occurred historically; for example, fire-scar studies have revealed that only low-intensity surface fire regimes occurred within the range of Bartram's stonecrop for the past three to five centuries (Swetnam *et al.* 2010, p. 15).

Crevices provide shade, shelter, and soil moisture retention, and offer Bartram's stonecrop plants protection from burning due to a lack of surrounding vegetation for fuel in the rocky terrain. Regardless, Bartram's stonecrop individuals have been burned. We are aware of 11 wildfires that occurred in known Bartram's stonecrop sites from 2007–2017, killing some Bartram's stonecrop individuals and removing shade in some sites (Ferguson 2014, pp. 9–10, 15, 28–29; Ferguson 2016a, p. 13; Ferguson 2016b, entire; Ferguson 2017c, p. 32; Ferguson 2017h, p. 2). Wildfires have burned in all nine sky island mountain ranges of southern Arizona with known Bartram's stonecrop occurrences within the last decade. Wildfire could potentially cause extirpation of small Bartram's stonecrop populations throughout the range of the species and have negative impacts on larger populations. Bartram's stonecrop seeds are very tiny, reside at or near the soil surface (Shohet 1999, p. 48), and show no characteristics that would promote survival in a wildfire.

Indirect threats to the species from fire include increased runoff of floodwaters, post-fire flooding that may scour habitat, deposition of debris and sediment originating in the burned area that could cover individuals, erosion of habitat, 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.

(23) *Comment:* A commenter expressed that Bartram's stonecrop should be listed as endangered and critical habitat should be designated.

Response: When making a listing decision for a species under the Act, the Service must determine if the current status of the species indicates it is in danger of extinction throughout all or a significant portion of its range (an endangered species) or likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (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, and 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 Act's 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.

We reviewed the potential risk factors (*i.e.,* threats or stressors) that are affecting Bartram's stonecrop now and into the future. While there are multiple stressors affecting Bartram's stonecrop, the best available information indicates that these threats are not immediately impacting Bartram's stonecrop such that the species meets the definition of an endangered species under the Act.

Section 4(a)(3) of the Act requires the Secretary of the Interior (Secretary) to designate critical habitat concurrent with listing to the maximum extent prudent and determinable. The designation of critical habitat may not be prudent if 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. Bartram's stonecrop is an attractive and small plant that can be easily collected by gardeners and succulent enthusiasts. This stressor was first noted in 1982, and observed in 1997–1998. Three researchers described the potential for collection of Bartram's stonecrop and factors that may make collection more likely. The lifespan of Bartram's stonecrop plants has been estimated at 5–10 years, allowing sufficient time for discovery and collection. As noted in the August 8, 2012, 90-day finding for this species (77 FR 47352), 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. While documented instances of collection are limited, the impacts from collection can be profound for small populations. In this case, we have found that the designation of critical habitat for Bartram's stonecrop is not prudent at this time as it would be likely to put the species at higher risk of collection.

(24) *Comment:* The commenters state that there is no evidence that illegal collection of Bartram's stonecrop individuals is a significant threat and that illegal collection is unlikely due to the short lifespan of the species and difficulty growing it horticulturally.

Response: The illegal collection of succulents is known to occur, and is often difficult to detect. Illegal collection of Bartram's stonecrop individuals has been reported, and the threat from it is more pronounced in small populations such as those in which the species occurs. More than half (58 percent) of Bartram's stonecrop populations contain fewer than 50 individuals. The lifespan of Bartram's stonecrop plants has been estimated at 5–10 years, allowing sufficient time for discovery and collection.

Bartram's stonecrop is an attractive and small plant not available from nurseries that can be easily collected by gardeners and succulent enthusiasts. This stressor was first noted in 1982, when exact localities were excluded from a summary report due to the possibility of illegal collection. Tagged individuals were uprooted and taken from two sites in the Santa Rita Mountains in 1997–1998. Plants in close proximity to trails have higher discovery potential and are therefore more likely to be collected. Collectors advertise in internet forums seeking Bartram's stonecrop seedlings or rooted cuttings. The similar southern Arizona species, *Graptopetalum rusbyi* (San Francisco leatherpetal), is cultivated and legally available for sale from cactus nurseries. However, Bartram's stonecrop is more difficult to propagate and maintain in captivity and is therefore vulnerable to collection from the wild because collectors cannot find them for purchase in nurseries. 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. While documented instances of collection are limited, the impacts from collection can be profound for small populations.

(25) *Comment:* The commenters state that there is no evidence that trampling is a significant threat to Bartram's stonecrop.

Response: As Bartram's stonecrop is typically found in shady canyons, the possibility of individuals being lost to trampling remains. Trampling of individuals (direct mortality or damage due to crushing) related to recreation activities has been observed historically. Human traffic within Bartram's stonecrop populations can cause soil erosion and plant loss, including damage from researchers. Individual Bartram's stonecrop were trampled in a group of plants that bordered a campsite (Shohet 1999, p. 60). Westland Resources (2013, p. 19) noted that the potential placement of a trail through Bartram's stonecrop populations may impact individual plants. A Bartram's stonecrop plant in a group located within 10 meters (32.8 feet) of a frequently used hiking trail was covered by rock fall (Ferguson 2016a, pp. 14–15). Threats to individuals can be particularly important to small populations.

(26) *Comment:* Some commenters state that altered precipitation, drought, and flooding regimes pose an uncertain threat to Bartram's stonecrop, and that freezing is not detrimental unless severe.

Response: The southwestern United States is warming and experiencing severe droughts of extended duration, decreased stream flows, changes in amount and timing of snow melt, and changes in timing and severity of precipitation and flooding (CLIMAS 2014, entire). The seasonality and general precipitation requirements for Bartram's stonecrop are described in detail in the SSA report (chapter 2, p. 26). Bartram's stonecrop occurs in habitats and microhabitats with a higher soil moisture, humidity, and vegetative community indicative of more mesic conditions than other succulents. Drying of habitats and more arid conditions have been associated with population extirpation. Bartram's stonecrop and its habitat are very susceptible to drought, loss of humidity, increases in temperature, and increased intensity of storms and flooding (NPS 2015, p. 4).

Bartram's stonecrop occurs in Madrean woodlands characterized by warm, wet summers and mild winters. Precipitation within the sky island mountain ranges is bimodal, with winter snow and rain, and summer monsoon rain. Mean annual precipitation in these habitats is 10–17 inches, 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 (captured partially in the October and November ''winter'' data) precipitation is needed for Bartram's stonecrop flower production.

The current and projected future trends in precipitation in the range of Bartram's stonecrop are discussed in the SSA report's sections 2.6 and 4.5 (Service 2020a, pp. 26, 54–68). The region has experienced serious drought (a prolonged period of abnormally low rainfall) in recent decades (Bowers 2005, p. 421; Garfin *et al.* 2013, p. 3; CLIMAS 2014, entire). Winter precipitation, in particular, has decreased over the past century, as recorded by weather stations within sky island mountain ranges containing Bartram's stonecrop (see SSA report, figures 2.6a–h) (Service 2020a, pp. 27–30). Winter precipitation is projected to decrease in the southwestern United States (IPCC 2013, p. 1080).

Precipitation is projected to decrease in the future with climate change, although it is expected to be more intense when it does occur (Seager *et al.* 2007, p. 1181; Karl *et al.* 2009, pp. 24, 33). Some projections suggest an overall similar amount of precipitation in the Southwest, but that it will be distributed differently in timing and intensity (Zhang *et al.* 2012, p. 390). Most climate change scenarios predict that the American Southwest will also become warmer during the 21st century (Overpeck *et al.* 2012, p. 5; Karl *et al.* 2009, p. 129), and the frequency of droughts is projected to increase by the end of the 21st century.

Continuing drought, increased temperatures, and increased evapotranspiration are expected to reduce vegetation cover and shade in Bartram's stonecrop habitat through overstory tree loss (Ferguson 2014, p. 42). Such tree mortality has already been observed in Bartram's stonecrop populations, negatively impacting available microhabitat (Ferguson 2016a, pp. 12, 17, 26). Drought or reduced water resources disproportionately affect seedlings, as this stage is particularly vulnerable to desiccation.

Bartram's stonecrop plants 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). Crevices above the floodline offer protection from typical flood events. Bartram's stonecrop needs crevices in solid bedrock or in shallow soil pockets on rock ledges and cliffs in deep, narrow canyons above normal flood levels to avoid seeds and plants being washed away during flood events. An increase in the flood frequency or intensity could result in an increase in the number of plants dislodged.

Based on climate change projections, it is likely that the severity of storm events will increase, resulting in more runoff, more severe flooding events, and more erosion and sedimentation affecting populations, especially following wildfire events in the uplands. Rainfall events in the southwestern United States are projected to be less frequent but more intense, and larger flood events are expected to be more common in the future (Karl *et al.* 2009, p. 24). Erosion and soil loss from such storm events may increase with higher peak stream flows. Flooding can remove Bartram's stonecrop individuals occurring near the stream's edge and has the potential to remove entire small populations (Phillips *et al.* 1982, p. 10; The Nature Conservancy 1987, p. 2; Ferguson 2014, p. 42; Ferguson 2016a, p. 26; NPS 2015, p. 4; Ferguson 2017b, p. 15). One group within a Bartram's stonecrop population was extirpated due to dislodging from a flooding event followed by drying of habitat (The Nature Conservancy 1987, p. 2).

Bartram's stonecrop is susceptible to damage from freezing events (Ferguson 2014, pp. 23, 40). An early season frost was reported in one Bartram's stonecrop population, and a hard frost is suspected of killing all plants in another population (Indian Creek) in 2011. Frost events are not projected to decrease in severity (Kodra *et al.* 2011, p. 3).

Because continuing drought, more severe freezing events, and increased high intensity rainfall events all pose threats to Bartram's stonecrop across the range of the species, this stressor is considered in our analysis of future species viability. We conclude that abnormal freezing events can seriously damage or completely remove small populations.

(27) *Comment:* Three commenters indicated that the Service's conclusion that small and isolated populations are a threat to Bartram's stonecrop is incorrect.

Response: Small population size has the potential to decrease Bartram's stonecrop population resiliency, as all stressors are exacerbated in populations with only a small number 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.

Most known Bartram's stonecrop populations are small, with over half of known individuals of the species residing in five populations. Twenty-nine of the 50 extant known Bartram's stonecrop populations (58 percent) rangewide contain fewer than 50 individuals, and 43 populations (86 percent) contain fewer than 150 individuals. The effect of more minor threats such as erosion, trampling, and illegal collection are all increased when Bartram's stonecrop populations are already small.

Determination of Bartram's Stonecrop's Status

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of an endangered species or a threatened species. The Act defines ''endangered species'' as a species in danger of extinction throughout all or a significant portion of its range, and ''threatened species'' as a species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The Act requires that we determine whether a species meets the definition of ''endangered species'' or ''threatened species'' because of any of the following factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence.

Status Throughout All of Its Range

After evaluating threats to the species and assessing the cumulative effect of the threats under the section 4(a)(1) factors, we summarize our findings below. We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to Bartram's stonecrop.

Bartram's stonecrop has experienced population declines, and three populations have been lost entirely. Currently, 50 extant Bartram's stonecrop populations contain 4,682 individuals in the United States and Mexico. Four Bartram's stonecrop populations contain nonnative grasses and several more are near nonnative grasses resulting in current habitat loss and continued loss in the future (Factor A). Further, an altered fire regime (Factors A and E) impacts all populations currently or in the near future and drives the spread of nonnatives (Factor A), exacerbating the encroachment of nonnative grasses. Consequently, all remaining populations of Bartram's stonecrop 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 Bartram's stonecrop. These environmental conditions exacerbate an altered fire regime, driving the spread of nonnative grasses with competitive advantages 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 mountain range with Bartram's stonecrop occurrence (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. Twenty-nine of 50 populations (58 percent) are small (fewer than 50 individuals) (Factor E). Erosion (Factors A and E), trampling (Factor E), collection (Factor B), herbivory (predation) (Factor C), and fire (Factors A and E) have the potential to reduce 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). The existing regulatory mechanisms (Factor D) do not address the majority of the threats to the species. Conservation efforts have not yet been implemented for this species.

We find Bartram's stonecrop to face increased vulnerability to the current and future threats due to the small population sizes of the majority of populations (Factor E). Small populations are susceptible to the loss of genetic diversity, genetic drift, and inbreeding. Currently 47 populations spread across nine mountain ranges in the United States and three ranges in Mexico exist as single populations (*i.e.,* no subpopulations to provide further resiliency in case of extirpation). The mountain ranges are widely separated (14–42 kilometers (8.7–26 miles) apart) and 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, there may have been a loss of genetic diversity in the three extirpated populations. 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).

Regulatory mechanisms (Factor D) and other management efforts by USFS and NPS provide some benefit to Bartram's stonecrop, as the majority of known populations are located on USFS (67 percent of the area of populations) and NPS (22 percent) owned and managed lands. The Coronado National Forest Land and Resource Management Plan (Plan) includes actions to control nonnative invasive species, restore habitat for federally listed species, and contribute to the recovery of federally listed species (USFS 2018, pp. 38, 41, 44, 46, 49, and 175). The Plan recognizes Bartram's stonecrop occurrences on the Coronado National Forest (USFS 2018, pp. 54). The Arizona Department of Agriculture protects native plants including Bartram's stonecrop under the 2009 Arizona Native Plan Law (Arizona Revised Statutes Title 3. Agriculture § 3–903) and removal is restricted to salvage of the plants. However, these efforts have not been able to ameliorate the threat of nonnative plant species and the altered fire regime and effects of drought.

The overall range of the species has not been significantly reduced, although three populations are extirpated due to habitat alteration. Currently, 50 extant populations in 12 mountain ranges provides a level of protection from catastrophic events now and in the near future. While there are multiple stressors to the remaining populations, these stressors are not immediately impacting all populations such that Bartram's stonecrop is currently 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 stressors are occurring and impacting Bartram's stonecrop and will continue to do so 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 Bartram's stonecrop, which allows us to assess reproductive effects on the species and allows the species opportunities to rebound. The primary sources we examined in determining future scenarios include the RCP 4.5 and 8.5 models in the IPCC (2013 and 2014, entire) and Garfin *et al.* (2013, entire). 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. The threats to Bartram's stonecrop act synergistically to influence the viability of the species. For example, decreased water availability and invasion of nonnative grasses promote higher severity and frequency of fires, while the effect of fires in Bartram's stonecrop habitat is to promote nonnative grass invasion and increase the likelihood of post-fire runoff and loss of shade trees.

We find that Bartram's stonecrop is likely to become an endangered species throughout all of its range within the foreseeable future. It is facing threats across its range that have led to reduced resiliency, redundancy, and representation, and we expect the species to continue to decline into the future. Thus, after assessing the best available information, we conclude that Bartram's stonecrop is not currently in danger of extinction, but is likely to become in danger of extinction within the foreseeable future throughout all of its range.

Status Throughout a Significant Portion of Its Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. The court in *Center for Biological Diversity* v. *Everson,* 2020 WL 437289 (D.D.C. Jan. 28, 2020) (*Center for Biological Diversity*), vacated the aspect of the Final Policy on Interpretation of the Phrase ''Significant Portion of Its Range'' in the Endangered Species Act's Definitions of ''Endangered Species'' and ''Threatened Species'' (79 FR 37578; July 1, 2014) that provided that the Services do not undertake an analysis of significant portions of a species' range if the species warrants listing as threatened throughout all of its range. Therefore, we proceed to evaluating whether the species is endangered in a significant portion of its range—that is, whether there is any portion of the species' range for which both (1) the portion is significant; and (2) the species is in danger of extinction in that portion. Depending on the case, it might be more efficient for us to address the ''significance'' question or the ''status'' question first. We can choose to address either question first. Regardless of which question we address first, if we reach a negative answer with respect to the first question that we address, we do

not need to evaluate the other question for that portion of the species' range.

Following the court's holding in *Center for Biological Diversity,* we now consider whether there are any significant portions of the species' range where the species is in danger of extinction now (*i.e.,* endangered). In undertaking this analysis for Bartram's stonecrop, we choose to address the status question first—we consider information pertaining to the geographic distribution of both the species and the threats that the species faces to identify any portions of the range where the species is endangered.

For Bartram's stonecrop, we considered whether the threats are geographically concentrated in any portion of the species' range at a biologically meaningful scale. We examined the following primary threats to the species: Reduction in water availability; altered fire regime; effects of climate change; and erosion, sedimentation, and burial. Loss due to trampling, collection, herbivory, severe frost, or other stressors also have the potential to impact individual Bartram's stonecrop plants. The effects of these threats are exacerbated in small populations. Altered precipitation, drought, flooding, and freezing regimes from current and future climate change are issues for all Bartram's stonecrop populations. Synergistic interactions among wildfire, nonnative grasses, decreased precipitation, and increased temperatures cumulatively and cyclically impact all Bartram's stonecrop populations. Some populations are expected to be affected by threats due to varying causes. For example, a higher risk of fires as a result of cross-border human activity is expected in the Baboquivari, Chiricahua, Mule, Pajarito-Atascosa, Santa Rita, Patagonia, and Whetstone mountains, while a higher risk of fires as a result of recreationists is expected in the Chiricahua, Dragoon, Pajarito-Atascosa, Patagonia, Rincon, and Santa Rita mountains. We found no concentration of threats in any portion of Bartram's stonecrop's range at a biologically meaningful scale. Thus, there are no portions of the species' range where the species has a different status from its rangewide status. Therefore, no portion of the species' range provides a basis for determining that the species is in danger of extinction in a significant portion of its range, and we determine that the species is likely to become in danger of extinction within the foreseeable future throughout all of its range. This is consistent with the courts' holdings in *Desert Survivors* v. *Department of the Interior,* No. 16–cv–01165–JCS, 2018 WL 4053447 (N.D. Cal. Aug. 24, 2018), and *Center for Biological Diversity* v. *Jewell,* 248 F. Supp. 3d, 946, 959 (D. Ariz. 2017).

Determination of Status

Our review of the best available scientific and commercial information indicates that Bartram's stonecrop meets the Act's definition of a threatened species. Therefore, we are listing Bartram's stonecrop as a threatened species 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 consists of preparing draft and final recovery plans, beginning with the development of a recovery outline and making it available to the public within 30 days of a final listing determination. 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 reclassification from endangered to threatened (''downlisting'') or removal from protected status (''delisting''), 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 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.

Following publication of this final rule, 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 will be eligible for Federal funds to implement management actions that promote the protection or recovery of Bartram's stonecrop. Information on our grant programs that are available to aid species recovery can be found at *http://www.fws.gov/grants.*

Section 8(a) of the Act (16 U.S.C. 1537(a)) authorizes the provision of limited financial assistance for the development and management of programs that the Secretary of the Interior determines to be necessary or useful for the conservation of endangered or threatened species in foreign countries. Sections 8(b) and 8(c) of the Act (16 U.S.C. 1537(b) and (c)) authorize the Secretary to encourage conservation programs for foreign listed

species, and to provide assistance for such programs, in the form of personnel and the training of personnel.

Please let us know if you are interested in participating in recovery efforts for Bartram's stonecrop. 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)(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 any endangered or threatened 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.

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).

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to endangered plants. The prohibitions of section 9(a)(2) of the Act, codified at 50 CFR 17.61, make it illegal for any person subject to the jurisdiction of the United States to: Import or export; remove and reduce to possession from areas under Federal jurisdiction; maliciously damage or destroy on any such area; remove, cut, dig up, or damage or destroy 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; deliver, receive, carry, transport, or ship in interstate or foreign commerce, by any means whatsoever and in the course of a commercial activity; or sell or offer for sale in interstate or foreign commerce an endangered plant. Certain exceptions apply to employees of the Service, the National Marine Fisheries Service, other Federal land management agencies, and State conservation agencies.

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. With regard to endangered plants, a permit may be issued for scientific purposes or for enhancing the propagation or survival of the species. There are also certain statutory exemptions from the prohibitions, which are found in sections 9 and 10 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 section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a final listing on proposed and ongoing activities within the range of a listed species. The discussion below regarding protective regulations under section 4(d) of the Act complies with our policy.

II. Final Rule Issued Under Section 4(d) of the Act

Background

Section 4(d) of the Act contains two sentences. The first sentence states that the Secretary of the Interior (Secretary) shall issue such regulations as he deems necessary and advisable to provide for the conservation of species listed as threatened. The U.S. Supreme Court has noted that statutory language like ''necessary and advisable'' demonstrates a large degree of deference to the agency (see *Webster* v. *Doe,* 486 U.S. 592 (1988)). Conservation is defined in the Act to mean 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, the second sentence of 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)(1), in the case of fish or wildlife, or section 9(a)(2), in the case of plants. Thus, the combination of the two sentences of section 4(d) provides the Secretary with wide latitude of discretion to select and promulgate appropriate regulations tailored to the specific conservation needs of the threatened species. The second sentence 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, courts have upheld rules developed under section 4(d) as a valid exercise of agency authority where they prohibited take of threatened wildlife, or 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,* 2002 U.S. Dist. Lexis 5432 (W.D. Wash. 2002)). Courts have also upheld 4(d) rules that do not address all of the threats a species faces (*see State of Louisiana* v. *Verity,* 853 F.2d 322 (5th Cir. 1988)). As noted in the legislative history 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'' (H.R. Rep. No. 412, 93rd Cong., 1st Sess. 1973).

Exercising this authority under section 4(d), we have developed a 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 rule as a whole satisfies the requirement in section 4(d) of the Act to issue regulations deemed necessary and advisable to provide for the conservation of Bartram's stonecrop. As discussed above under Determination of Bartram's Stonecrop's Status, we have concluded that Bartram's stonecrop is likely to become in danger of extinction within the foreseeable future due to groundwater extraction and prolonged drought expected to reduce nearby water levels and humidity within Bartram's stonecrop's microenvironment, and altered fire regimes leading to erosion of Bartram's stonecrop habitat that could dislodge plants, to sedimentation that could cover individuals, and to loss of overstory shade trees. In addition, collection, trampling, herbivory, 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 4(d) rule will promote conservation of Bartram's stonecrop by encouraging management of the landscape in ways that meet both land management considerations and the conservation needs of Bartram's stonecrop. The provisions of this rule are one of many tools that the Service will use to promote the conservation of Bartram's stonecrop.

Provisions of the 4(d) Rule

This 4(d) rule provides for the conservation of Bartram's stonecrop by prohibiting the following activities, 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.

As discussed under Summary of Biological Status and Threats, 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 damage or collection of Bartram's stonecrop from lands under Federal jurisdiction; and

(2) Malicious destruction or degradation of the species or associated habitat on lands under Federal jurisdiction, including:

(a) The intentional introduction of nonnative organisms that compete with or consume Bartram's stonecrop;

(b) Ground-disturbing activities that impact the species or its habitat;

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

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

(e) Activities that would reduce shade or lower the water table such that the cooler, humid microenvironment is affected.

These activities are provided as examples of actions that may affect Bartram's stonecrop and are not intended to be a list of prohibitions under the final 4(d) rule for Bartram's stonecrop. As a whole, the 4(d) rule will help in the efforts to recover Bartram's stonecrop by prohibiting activities that damage individuals and populations and providing exceptions to those prohibitions for permitted or conservation activities.

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, which states that ''the Director may issue a permit authorizing any activity otherwise prohibited with regard to threatened species.'' That regulation also states, ''The permit shall be governed by the provisions of this section unless a special rule applicable to the plant is provided in sections 17.73 to 17.78.'' We interpret that second sentence to mean that permits for threatened species are governed by the provisions of section 17.72 unless a special rule, which we have defined to mean a species-specific 4(d) rule, provides otherwise. We recently promulgated revisions to section 17.71 providing that section 17.71 will no longer apply to plants listed as threatened in the future. We did not intend for those revisions to limit or alter the applicability of the permitting provisions in section 17.72, or to require that every species-specific 4(d) rule spell out any permitting provisions that apply to that species and species-specific 4(d) rule. To the contrary, we anticipate that permitting provisions would generally be similar or identical for most species, so applying the provisions of section 17.72 unless a species-specific 4(d) rule provides otherwise would likely avoid substantial duplication. Moreover, this interpretation brings section 17.72 in line with the comparable provision for wildlife at 50 CFR 17.32, in which the second sentence states, ''Such permit shall be governed by the provisions of this section unless a special rule applicable to the wildlife, appearing in sections 17.40 to 17.48, of this part provides otherwise.'' Under 50 CFR 17.12 with regard to threatened plants, a permit may be issued for the following purposes: For scientific purposes, to enhance propagation or survival, for economic hardship, for botanical or horticultural exhibition, for educational purposes, or for other purposes consistent with the purposes and policy of the Act. Additional statutory exemptions from the prohibitions are found in sections 9 and 10 of the Act.

We recognize 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, any qualified employee or agent of a State conservation agency that 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, will be able to conduct activities designed to conserve Bartram's stonecrop that may result in otherwise prohibited activities without additional authorization.

Nothing in this 4(d) rule changes 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.

III. Critical Habitat

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 (*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 at 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 Federal agency would be required to consult with the Service under section 7(a)(2) of the Act. However, even if the Service were to conclude that the proposed activity would result in destruction or adverse modification of the critical habitat, the Federal action agency and the landowner are not required to abandon the proposed activity, or to restore or recover the species; instead, they must 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 occupied 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 Endangered Species 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 prohibitions found in section 9 of the Act. 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.

In the proposed listing rule (84 FR 67060; December 6, 2019), we determined that designation of critical habitat for Bartram's stonecrop would not be prudent. However, we invited public comment and requested information on the threats of taking or other human activity, on Bartram's stonecrop and its habitat, and the extent to which designation might increase those threats.

During the comment period, we did not receive any substantive comments, or any comments that would require us to change the not prudent determination or our rationale for it (see 84 FR 67060, December 6, 2019, p. 84 FR 67088). Therefore, we restate our conclusion that the designation of critical habitat is not prudent, in accordance with 50 CFR 424.12(a)(1), because Bartram's stonecrop faces a threat by collection, and designation can reasonably be expected to increase the degree of these threats to the species by making location information more readily available.

Required Determinations

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

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 the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*) 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). 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)).

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 determined that no Tribal interests will be affected by this rule.

References Cited

A complete list of references cited in the SSA report and this rulemaking is available on the internet at *http://www.regulations.gov* under Docket No. FWS–R2–ES–2018–0104 and upon request from the Arizona Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this final rule are the staff members of the U.S. Fish and Wildlife Service Species Assessment Team and 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.

Regulation Promulgation

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

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

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

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

■ 2. Amend § 17.12 in paragraph (h), the List of Endangered and Threatened Plants, by adding an entry for ''*Graptopetalum bartramii*'' in alphabetical order under FLOWERING PLANTS to read as follows:

§ 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	86 FR [INSERT **Federal Register** PAGE WHERE THE DOCUMENT BEGINS], 8/31/2021; 50 CFR 17.73(a). [4d]
*	*	*	*	*

■ 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 this paragraph (a)(1).

(2) *Exceptions 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 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].

Martha Williams,

Principal Deputy Director Exercising the Delegated Authority of the Director, U.S. Fish and Wildlife Service.

[FR Doc. 2021–18476 Filed 8–30–21; 8:45 am]

BILLING CODE 4333–15–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 20

[Docket No. FWS–HQ–MB–2020–0032; FF09M22000–212–FXMB1231099BPP0]

RIN 1018–BE34

Migratory Bird Hunting; 2021–2022 Seasons for Certain Migratory Game Birds

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: This rule prescribes the seasons, hours, areas, and daily bag and possession limits for hunting migratory birds. Taking of migratory birds is prohibited unless specifically provided for by annual regulations. This rule permits the taking of designated species during the 2021–22 season.

DATES: This rule takes effect on August 31, 2021.

ADDRESSES: You may inspect comments received on the migratory bird hunting regulations at *http://www.regulations.gov* at Docket No. FWS–HQ–MB–2020–0032. You may obtain copies of referenced reports from the Division of Migratory Bird Management's website at *http://www.fws.gov/migratorybirds/,* or at *http://www.regulations.gov* at Docket No. FWS–HQ–MB–2020–0032.

FOR FURTHER INFORMATION CONTACT: Jerome Ford, U.S. Fish and Wildlife Service, Department of the Interior, (202) 208–1050.

SUPPLEMENTARY INFORMATION:

Regulations Schedule for 2021

On October 9, 2020, we published in the **Federal Register** (85 FR 64097) a proposal to amend title 50 of the Code of Federal Regulations (CFR) at part 20. The proposal provided a background and overview of the migratory bird hunting regulations process, and addressed the establishment of seasons, limits, and other regulations for hunting migratory game birds under §§ 20.101 through 20.107, 20.109, and 20.110 of subpart K. Major steps in the 2021–22 regulatory cycle relating to open public meetings and **Federal Register** notifications were illustrated in the diagram at the end of the October 9, 2020, proposed rule. For this regulatory cycle, we combined the elements described in that diagram as ''Supplemental Proposals'' with the one described as ''Proposed Season Frameworks.''

We provided the meeting dates and locations for the Service Regulations Committee (SRC) and Flyway Council meetings on Flyway calendars posted on our website at *https://www.fws.gov/birds/management/flyways.php.* On October 20–21, 2020, we held open meetings with the Flyway Council Consultants, at which the participants reviewed information on the current status of migratory game birds and developed recommendations for the 2021–22 regulations for these species. The October 9, 2020, proposed rule provided detailed information on the proposed 2021–22 regulatory schedule and announced the SRC meetings.

On February 22, 2021, we published in the **Federal Register** (86 FR 10622) the proposed frameworks for the 2021–22 season migratory bird hunting regulations. On July 16, 2021, we published in the **Federal Register** (86 FR 37854) the final frameworks for migratory game bird hunting regulations, from which State wildlife conservation agency officials selected seasons, hours, areas, and limits for hunting migratory birds during the 2021–22 season.

The final rule described here is the final in the series of proposed, supplemental, and final rulemaking documents for migratory game bird hunting regulations for the 2021–22 season, and deals specifically with amending subpart K of 50 CFR part 20. It sets hunting seasons, hours, areas, and limits for migratory game bird species. This final rule is the culmination of the annual rulemaking process allowing migratory game bird hunting, which started with the October 9, 2020, proposed rule. As discussed elsewhere in this document, we supplemented that proposal on February 22, 2021, and published final season frameworks on July 16, 2021, that provided the season selection criteria from which the States selected these seasons. This final rule sets the migratory game bird hunting seasons based on that input from the States. We previously addressed all