DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R2–ES–2016–0103; 4500030113]

RIN 1018–AZ02

Endangered and Threatened Wildlife and Plants; Endangered Species Status for Sonoyta Mud Turtle

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to list the Sonoyta mud turtle (*Kinosternon sonoriense longifemorale*), a native subspecies from Arizona in the United States and Sonora in Mexico, as an endangered species under the Endangered Species Act (Act). If we finalize this rule as proposed, it would extend the Act's protections to this subspecies. The effect of this regulation will be to add this subspecies to the List of Endangered and Threatened Wildlife.

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

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

(1) *Electronically*: Go to the Federal eRulemaking Portal: *http://www.regulations.gov*. In the Search box, enter FWS–R2–ES–2016–0103, which is the docket number for this rulemaking. Then, in the Search panel on the left side of the screen, under the Document Type heading, click on the Proposed Rules link to locate this document. You may submit a comment by clicking on "Comment Now!"

(2) *By hard copy*: Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: FWS–R2–ES–2016–0103; U.S. Fish & Wildlife Service Headquarters, MS: BPHC, 5275 Leesburg Pike, Falls Church, VA 22041–3803.

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

FOR FURTHER INFORMATION CONTACT: Steve Spangle, Field Supervisor, U.S. Fish and Wildlife Service, Arizona Ecological Services Field Office, 9828 North 31st Ave #C3, Phoenix, AZ 85051–2517, by telephone 602–242–0210 or by facsimile 602–242–2513. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, if a species is determined to be an endangered or threatened species throughout all or a significant portion of its range, we are

required to promptly publish a proposal in the **Federal Register** and make a determination on our proposal within one year. Critical habitat shall be designated, to the maximum extent prudent and determinable, for any species determined to be an endangered or threatened species under the Act. Listing a species as an endangered or threatened species and designations and revisions of critical habitat can only be completed by issuing a rule. We will be providing a proposal to designate critical habitat for the Sonoyta mud turtle under the Act in the near future.

Our proposed determination. This document proposes the listing of the Sonoyta mud turtle (*Kinosternon sonoriense longifemorale*) as an endangered species. The Sonoyta mud turtle is currently a candidate species for which we have on file sufficient information on biological vulnerability and threats to support preparation of a listing proposal, but for which development of a listing regulation has been precluded by other higher priority listing activities. This proposed rule reassesses all available information regarding status of and threats to the Sonoyta mud turtle.

The basis for our action. Under the Act, we can determine that a species is an endangered or threatened species based on any of five factors after taking into account those efforts to protect such species: (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 Factors A (reduction or loss of water availability; reduction or loss of riparian habitat components; reduction or loss of invertebrate prey), C (nonnative predators), and E (climate change) are and will continue to affect the populations of Sonoyta mud turtle. The Act defines the term "species" to include any subspecies of fish or wildlife or plants.

We will seek peer review. We will seek comments from independent specialists to ensure that our designation is based on scientifically sound data, assumptions, and analyses. We will invite these peer reviewers to comment on our listing proposal. Because we will consider all comments and information received during the comment period, our final determinations may differ from this proposal.

To provide the necessary and most up-to-date information and background on which to base our determination, we completed a Species Status Assessment Report for the Sonoyta mud turtle (SSA Report; Service 2016, entire), which is available online at *http://www.regulations.gov*, Docket No. FWS–R2–ES–2016–0103. The SSA Report documents the results of the comprehensive biological status review for the Sonoyta mud turtle and provides an account of the subspecies' overall viability through the forecasting of the condition of surviving populations into the future (Service 2016, entire). In the SSA Report, we summarized the relevant biological data, described the past, present, and likely future risk factors (causes and effects), and conducted an analysis of the viability of the subspecies. The SSA Report provides the scientific basis that informs our regulatory decision regarding whether this subspecies should be listed under the Act. This decision involves the application of standards within the Act, its implementing regulations, and Service policies (see Finding). The SSA Report contains the risk analysis on which this finding is based, and the following discussion is a summary of the results and conclusions from the SSA Report. Species experts and appropriate agencies provided input into the development of the SSA Report. Additionally, we will invite peer reviewers to provide a review of the SSA Report.

Information Requested

Public Comments

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

(1) The Sonoyta mud turtle's biology, range, and population trends, including:

(a) Biological or ecological requirements of the species, including habitat requirements for feeding, breeding, and sheltering;

(b) Genetics and taxonomy;

(c) Historical and current range including distribution patterns;

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

(e) Past and ongoing conservation measures for the species, its habitat or both.

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

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

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

(5) Information related to climate change within the range the Sonoyta mud turtle and how it may affect the species' habitat.

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

(7) The following specific information on:

(a) The amount and distribution of habitat for the Sonoyta mud turtle.

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

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

(d) What areas not occupied at the time of listing are essential for the conservation of the species and why.

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

Also please note that submissions merely stating support for or opposition to the action under consideration without providing supporting information, although noted, will not be considered in making a determination, as section 4(b)(1)(A) of the Act directs that determinations as to whether any species is a threatened or endangered species must be made "solely on the basis of the best scientific and commercial data available."

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

If you submit information via *http://www.regulations.gov*, your entire submission—including any personal identifying information—will be posted on the website. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on *http://www.regulations.gov*.

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on *http://www.regulations.gov*, or by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Arizona Ecological Services Office (see **FOR FURTHER INFORMATION CONTACT**).

Public Hearing

Section 4(b)(5) of the Act provides for one or more public hearings on this proposal, if requested. Requests must be received within 45 days after the date of publication of this proposed rule in the **Federal Register**. Such requests must be sent to the address shown in **FOR FURTHER INFORMATION CONTACT**. We will schedule public hearings on this proposal, if any are requested, and announce the dates, times, and places of those hearings, as well as how to obtain reasonable accommodations, in the **Federal Register** and local newspapers at least 15 days before the hearing.

Peer Review

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), we have sought the expert opinions of at least three appropriate and independent specialists regarding this proposed rule. The purpose of peer review is to ensure that our listing determination is based on scientifically sound data, assumptions, and analyses. The peer reviewers have expertise in the Sonoyta mud turtle's biology, habitat, physical or biological factors, or threats. We are inviting comment from the peer reviewers during this public comment period.

Previous Federal Actions

We identified the Sonoyta mud turtle as a candidate species with a listing priority number (LPN) of 3 in the annual Candidate Notice of Review (CNOR) on September 19, 1997 (62 FR 49398). Candidates are those fish, wildlife, and plants for which we have on file sufficient information on biological vulnerability and threats to support preparation of a listing proposal, but for which development of a listing regulation is precluded by other higher priority listing activities. We reaffirmed the Sonoyta mud turtle's candidate status in subsequent annual CNORs (64 FR 57534, October 25, 1999; 66 FR 54808, October 30, 2001; 67 FR 40657, June 13, 2002; 69 FR 24876, May 4, 2004; 70 FR 24870, May 11, 2005; 71 FR 53756, September 12, 2006; 72 FR 69033, December 6, 2007; 73 FR 75175, December 10, 2008; 74 FR 57804, November 9, 2009; 75 FR 69222, November 10, 2010; and 76 FR 66370, October 26, 2011; 77 FR 69994, November 21, 2012; 78 FR 70104, November 22, 2013; 79 FR 72450, December 5, 2014; and 80 FR 80585, December 24, 2015). In 2012, based on a change in the timing of the threat from the reduction of surface water to non-imminent, we changed the Sonoyta mud turtle LPN from 3

to 6, which reflects a subspecies with threats that are non-imminent and high in magnitude. We retained an LPN of 6 through the latest CNOR.

On May 4, 2004, we received a petition from the Center for Biological Diversity and others (petitioners) requesting the Service to list 225 plants and animals as endangered under the Endangered Species Act, as amended (16 U.S.C. 1531 *et seq*.), including the Sonoyta mud turtle and to designate critical habitat. On September 9, 2011, the Service entered into two settlement agreements regarding species on the candidate list at that time (Endangered Species Act Section 4 Deadline Litigation, No. 10–377 (EGS), MDL Docket No. 2165 (D.D.C. May 10, 2011)). This proposed rule fulfills that requirement of those settlement agreements for the Sonoyta mud turtle. We will also be providing a proposal to designate critical habitat for the Sonoyta mud turtle under the Act in the near future.

Background

The Act directs us to determine whether any species is an endangered species or a threatened species because of any of the five enumerated factors, and taking into account the effect of conservation measures. The Act defines the term "species" to include any subspecies of fish or wildlife or plants. We completed a comprehensive evaluation of the taxonomy, life history, ecology, and biological status of the Sonoyta mud turtle *(Kinosternon sonoriense longifemorale),* and we provide a thorough assessment of the species' overall viability in the SSA Report (Service 2016, pp. 4–5; available at *http://www.regulations.gov* and the Arizona Ecological Services Office *https://www.fws.gov/southwest/es/arizona/*).

Summary of Biological Status and Threats

The Sonoyta mud turtle is one of two recognized subspecies of Sonora mud turtle (*Kinosternon sonoriense*) and has been differentiated from the other subspecies based on morphometric (shape or form of organism) analysis of shell measurements and mitochondrial DNA analysis (Iverson 1981, p. 62; Rosen 2003, entire; Rosen *et al*. 2006, entire). The other subspecies, *K. s. sonoriense*, is commonly referred to as Sonora mud turtle. Figure 1 below depicts the location of each subspecies. The Sonoyta mud turtle is a dark, medium-sized freshwater turtle with a mottled pattern on the head, neck, and limbs. The Sonoyta mud turtle is an isolated, native endemic (found in certain areas) of southern Arizona and northern Sonora, Mexico. At Quitobaquito, annual survivorship of adults (7–12 years old) and juveniles (<7 years old) has been estimated by Rosen and Lowe (1996, p. 23) and Riedle *et al.* (2012, p. 187) with similar results. Male survivorship ranged from 0.83–0.95, female survivorship ranged from 0.85–0.95, and juvenile survivorship was lower than adult survivorship with a gradual transition to higher survivorship as turtles moved towards adulthood (Riedle *et al.* 2012, p. 187; Rosen and Lowe 1996, p. 23).

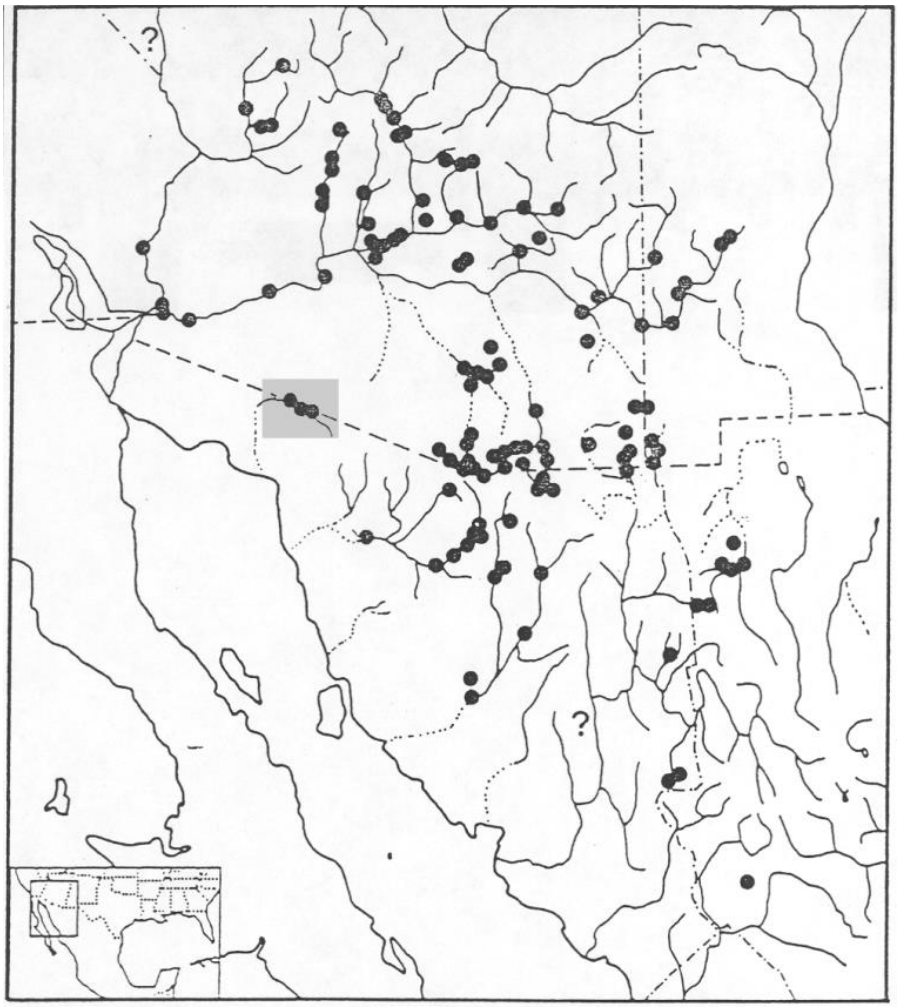

Figure 1.—Entire species range is shown above with Sonoyta mud turtle subspecies depicted in gray box (Iverson 1992, p. 235). The black dots outside of the gray box are known occurrences of the other subspecies, Sonora mud turtle.

Sonoyta mud turtles occur in areas of an arid environment that commonly experience drought and extreme heat (ambient temperatures can exceed 45 degrees Celsius (°C) (113 degrees Fahrenheit (°F))) and in order to survive and complete life-history functions need both perennial sources of water with aquatic vegetation and riparian areas with moist soil. Sonoyta

mud turtles spend most of their time in water because water is essential to survival of individuals, as it provides food and prevents desiccation. Water is also needed to provide moisture for soil in riparian areas needed for nesting and estivation (spending time in a prolonged state of torpor or dormancy) during drought. Lastly, water with aquatic vegetation is needed to support invertebrate prey and provide shelter from predators. Sonoyta mud turtles are primarily opportunistic carnivores feeding on a variety of invertebrates that are on the bottom of ponds and streams or attached to submerged vegetation. In habitat with poor invertebrate fauna they will also feed on small vertebrates, carrion, and plants (Hulse 1974, pp. 197–198; Lovich *et al.* 2010, pp. 135–136; Rosen 1986, pp. 14 & 31; Rosen and Lowe 1996a, pp. 32–35; Stanila *et al.* 2008, p. 345).

Sonoyta mud turtles are found in stream channels, and natural and manmade ponds. Water in ponds is supplied by either springs or human waste-water effluent. Aquatic habitat in ponds and stream channels is usually shallow (to 2 meters (m) (7 feet (ft)), with a rocky or sandy bottom and aquatic, emergent vegetation. Hatchlings, juveniles, and subadults prefer shallow water with dense aquatic vegetation and overhanging vegetation along the stream channel or pond margin that provides foraging opportunities as well as protection from predators. Adults prefer water with complex structure including overhanging vegetation along the stream channel or pond margin but also deeper sections of ponds where they forage for benthic invertebrates along the bottom.

Terrestrial habitat of Sonoyta mud turtles is characterized by riparian vegetation with moist soil that surrounds a pond or lines a stream channel, and occurs along the banks of ponds and streams, as well as in intermittently dry sections of the stream channel itself. Sonoyta mud turtles in dry or low surface water reaches will either travel along intermittent dry sections of a

stream channel to find water or they will estivate. Riparian vegetation provides some level of protection from predators while turtles are out of the water, and it also creates a microclimate that supports moist soil. Moist soil is needed to prevent desiccation of adults and juveniles while traveling between wetted sites or during estivation. Terrestrial estivation sites consist of depressions under vegetation, soil, or organic matter; in rock crevices; or in soil burrows under overhanging banks of streams or ponds. Sonoyta mud turtles can endure lack of surface water for a short time by estivating, but prolonged and recurrent estivation will reduce fitness and increase mortality over the long term. Riparian vegetation and corresponding moist soil are also needed for nest sites. In mid to late July through September, females leave the water briefly to lay eggs in terrestrial nests that maintain some level of moisture such as vegetation litter, soil burrows, or possibly even in rock crevices. The SSA Report has more detailed discussion of our evaluation of the biological status of the Sonoyta mud turtle and the influences that may affect its continued existence.

The Sonoyta mud turtle was historically found only in the Rio Sonoyta basin in Arizona and Sonora, Mexico (Figure 3.1.1.a. in the SSA Report). There were likely four populations of the Sonoyta mud turtle distributed throughout the Rio Sonoyta basin in Arizona and Sonora (SSA Report Figure 3.1.1.b.). One population was located at Quitobaquito in southern Arizona in an area that is now within the Organ Pipe Cactus National Monument. This population is north of the Rio Sonoyta, but fossil spring deposits to the west of Quitobaquito Springs indicate that, during floods or in times of greater natural flow, water filled an adjacent wash and likely established a connection to the Rio Sonoyta (Miller and Fuiman 1987, p. 603). The other three populations occurred in distinct perennial reaches of the Rio Sonoyta in Sonora, Mexico, just south of the U.S.-Mexico border. These included the Papalote reach, Santo Domingo reach, and

Sonoyta reach of Rio Sonoyta. The Rio Sonoyta probably flowed continuously for short periods during the wet season providing connectivity for mud turtles allowing for immigration and emigration and then retracted during the dry season. This assumption is based on our understanding of the historical literature of hydrological conditions in the period 1854–1936 (Rosen et al. 2010, p. 146). These three distinct perennial reaches of the Rio Sonoyta (Papalote reach, Santo Domingo reach, and Sonoyta reach) together likely provided 19–27 km (11.8–16.8 mi) of stream habitat for the Sonoyta mud turtle (Table 1.). This amount is estimated from measuring maps in the historical literature of hydrological conditions in the period 1854–1936 (Rosen et al. 2010, p. 146). The best available commercial and scientific data does not indicate any additional populations.

Currently, there are five extant populations. The Quitobaquito Springs population in Organ Pipe Cactus National Monument, Arizona, is extant (National Park Service (NPS) 2015, p. 1). Populations in the Papalote reach and Sonoyta reach (now Xochimilco reach) of Rio Sonoyta are extant, but perennial water flow in their reaches are reduced. The historical population in the Santo Domingo reach of the Rio Sonoyta is now likely extirpated due to loss of perennial surface water (P. Rosen, pers. comm., 2016; Rosen 3004, pp. 4–5). The Sonoyta sewage lagoon and Quitovac populations in Mexico were historically unknown and recently found by Knowles et al. 2002 (p. 74) investigating potential new turtle habitats in and around the Rio Sonoyta basin. Turtles were reported in the Sonoyta sewage lagoon in October 2001 (Knowles et al. 2002, p. 4); turtles either dispersed there from the upstream Xochimilco reach or were released by humans soon after the sewage lagoon came into operation in 1994. The Sonoyta sewage lagoon population is in the town of Sonoyta adjacent to the Rio Sonoyta. The Sonoyta sewage lagoon is a settling pond for raw wastewater from the town of

Sonoyta. Sonoyta mud turtles were also discovered in spring runs and ponds at Quitovac in March 2002 (Knowles et al. 2002, p. 72). Quitovac is located about 40 km (25 mi) southwest of the town of Sonoyta and outside of the Rio Sonoyta basin, in the Rio Guadalupe basin. It is unclear when this population was established, and geography suggests that the turtle population may have resulted from human introduction of turtles.

The perennial water supporting all five turtle populations has been reduced, and all populations are small and isolated. Discharge from Quitobaquito springs has diminished by 42 percent over the past 35 years with 5,500 cubic feet (cf)/day average discharge measured in the period 1981–1992 down to 3,157 cf/day measured from 2005–present (Carruth 1996, pp. 13, 21; Peter Holm, pers. comm., 2016). Thus far, declining spring flow has been associated with < 30 centimeters (cm) (12 inches (in)) of surface water level decline at the pond, the depth of which ranges from 81 to 94 cm (32 to 37 inches). Today, the five Sonoyta mud turtle populations are isolated from one another even more than they used to be historically because the lengths of the distinct perennial reaches in the Rio Sonoyta have contracted. The perennial waters in these reaches have decreased by 80 to 92 percent from 19–27 km (11.8–16.8 mi) historically to approximately 1.5–5.5 km (0.9–3.4 mi) currently (Table 1. Historical and Current Population Data below, and Figure 3.1.1 of the SSA Report). Periodic movement between populations in the Rio Sonoyta basin may occur during periods of high rainfall, but the extent of immigration and emigration of turtles is unknown. However, we assume that movement among populations is rare to limited due to distances between populations coupled with limited hydrological connection. The Quitovac population is outside of the Rio Sonoyta watershed, in the Rio Guadalupe basin, and has no present-day hydrological connection to the Rio Sonoyta.

Table 1 lists the status and condition of each population. We believe that the historical locations of the Sonoyta mud turtle occurred in the areas of the Rio Sonoyta basin that maintained perennial surface water via springs fed by ground water and that these locations may no longer have reliable water to support mud turtles (Paredes-Aguilar and Rosen 2003, p. 2; Rosen *et al.* 2010, p. 155).

Table 1.—Historical and current population data of the Sonoyta mud turtle.

Location	Land Ownership	Abundance		Distribution			Status
				Historical	Current		
		Historical	Current	Perennial Stream km (mi)	Perennial Stream km (mi)	Area ha (ac)	
AZ							
Quitobaquito	Organ Pipe Cactus National Monument	Several hundred in 1950s	2015 = 141±25	unknown	0.244	<0.27 (0.67)	Extant
			Avg = 110[1]		-0.15		
Mexico							
Rio Sonoyta							
Papalote Reach (or the Agua Dulce)	Mexican NPS, Rio Sonoyta, Pinacate Biosphere Reserve	unknown	2003 = >100, low density	5–6	1.5 to 3	pool size 2–4.5 m^2	Extant
			Now = unknown	(3.1–3.7)	(0.9–1.9)	(22–48 ft^2)	
Santo Domingo	Ejido Josefa Ortiz de Dominguez	unknown	0	4–6	0		Extirpated
				(2.5–3.7)			
Sonoyta Reach (reduced to Xochimilco reach)	Town of Sonoyta	unknown	2002 = ~345	10–15	0 to 2.5	pool size 10–48 m^2	Extant
			Now = unknown	(6.2–9.3)	(0–1.6)	(107–516 ft^2)	
Rio Sonoyta Total				19–27			
				(11.8–16.8)			
Sonoyta Sewage Lagoon	Town of Sonoyta	N/A	N/A	N/A	N/A	>5	Extant
						(>12.3)	
Quitovac	Quitovac y su anexo el Chujubabi	N/A	2002 = ~200	N/A	N/A	>1	Extant
						(>2.5)	

[1]Estimates from Quitobaquito include adults only; no young-of-the-year are included. This average is from 2001 to 2015.

For the Sonoyta mud turtle to maintain viability, its populations, or some portion of its populations, must be resilient enough to withstand stochastic events such as fluctuations in water levels, habitat modification, and introduction of nonnative predators. In a highly resilient Sonoyta mud turtle population, turtles are able to complete their life functions and breeding is successful enough to maintain a population that is able to withstand stochastic events. Influencing these population factors are elements of Sonoyta mud turtle habitat (surface water availability, amount of riparian habitat and benthic invertebrates, and lack of nonnative predators) that determine whether survivorship among age classes is achieved in Sonoyta mud turtle populations, thereby increasing the resiliency of populations. Population resiliency categories for the Sonoyta mud turtle are described in Table 3.3.1. of the SSA Report, and habitat factors used to develop these resiliency levels are discussed below and outlined in Table 3.4.2. of the SSA Report. As discussed below, water is the primary limiting factor, and, therefore, water drives the condition of each population.

Representation in the form of genetic or ecological diversity is important to maintain the Sonoyta mud turtle's capacity to adapt to future environmental changes. Genetic investigations (Rosen 2003, pp. 8–13; Rosen *et al*. 2006, p. 10) indicate the subspecies exhibits some level of genetic diversity among populations at Quitobaquito, in the Papalote reach and the Xochimilco reach of the Rio Sonoyta, and at Quitovac. The population in the Sonoyta sewage lagoon was not sampled, so we have no information on genetics of this population. Exchange of genetic material between Quitobaquito and populations along the Rio Sonoyta is unlikely due to lack of hydrological connection. Exchange of genetic material among populations of the Rio Sonoyta is likely a rare event limited to instances when a mud turtle may move during the wet season if there are prolonged periods of precipitation that cause a high flow event along the Rio Sonoyta or connects these populations by providing stepping stones of wetted habitat

through which mud turtles could move or disperse.

The Sonoyta mud turtle historically occupied habitat in two ecological settings including cienegas (a spring that is usually a wet, marshy area at the foot of a mountain, in a canyon, or on the edge of a grassland where ground water bubbles to the surface) and streams, both supported by ground water via springs. Currently, there are still populations within stream habitat but all the cienegas have either dried completely or been modified from their natural state. There are also two manmade impoundments that were created to capture spring flow that now support Sonoyta mud turtles. Currently, the Sonoyta mud turtle exhibits genetic and ecological diversity. Maintaining representation in the form of genetic or ecological diversity is important to maintain the Sonoyta mud turtle's capacity to adapt to future environmental changes. The loss of Quitobaquito, Quitovac, and either Rio Sonoyta Papalote or Rio Sonoyta Xochimilco populations would reduce the representation for the species.

Redundancy describes the ability of a species to withstand catastrophic events. Measured by the number of populations, their resiliency, and their distribution (and connectivity), redundancy gauges the probability that the species has a margin of safety to withstand or can bounce back from catastrophic events (such as a rare destructive natural event or episode involving one or more populations). The Sonoyta mud turtle needs multiple resilient populations spread over their range distributed in such a way that a catastrophic event will not result in the loss of all populations. Currently four of the populations are spread throughout a small area of the Rio Sonoyta basin, and one population is in the northern part of the Rio Guadalupe basin. It is possible that a catastrophic event such as severe drought could impact three of the five populations—Papalote reach, Xochimilco reach, and Quitobaquito. Conversely, catastrophic events such as disease would not likely impact multiple populations since the hydrological connection among populations is limited or nonexistent. While there could be rare or limited movement of individuals between populations, all populations are isolated in terms of one population being able to

repopulate another should one be lost due to a catastrophic event.

The Service evaluated the stressors affecting the conservation status of the Sonoyta mud turtle, which include water loss, loss of riparian habitat, amount of invertebrate prey, presence of nonnative species, and land management activities incompatible with maintaining needed habitat (such as dredging). Of these stressors, water loss caused by drought and ground water pumping, both of which are exacerbated by climate change, and changes to wastewater infrastructure are the primary activities impacting the Sonoyta mud turtle. The other stressors to the Sonoyta mud turtle include the loss of invertebrate prey and presence of nonnative species. These stressors can be additive in terms of effects to populations that are already stressed by water loss. The following is a summary of these stressors affecting the Sonoyta mud turtle. These stressors are described in detail in Appendix A of the SSA Report.

Ground water pumping impacts the amount of surface water in habitats used by Sonoyta mud turtles because the perennial sections of the Rio Sonoyta as well as the pond at Quitobaquito and Quitovac are supplied by ground water. As with all streams, the Rio Sonoyta exists in an area where runoff has concentrated into a definable channel. In most of the Rio Sonoyta, the channel cuts into dry soils, so that flow is ephemeral and only in response to precipitation. In the Papalote and Xochimilco reaches of the Rio Sonoyta where Sonoyta mud turtles live, the defined channel intersects regional ground water held in storage, the ground water saturates streamside channel bottom soils, and water is discharged to the stream. In a hypothetical, unaffected system, equilibrium exists so that recharge and discharge volumes of water are equal. When pumping occurs in such a ground water system, it alters this equilibrium so that less water is available for discharge to the stream and springs and reduces the amount of surface water available to the Sonoyta mud turtle.

Ground water can also reach the ground surface outside of a stream channel via springs like those that supply water to habitats of the Sonoyta mud turtle at Quitobaquito and Quitovac. Quitobaquito Springs is likely supplied by ground water but is considered somewhat isolated from the regional aquifer in the Sonoyta Valley (Carruth 1996, pp. 14, 18). It is possible that there is a connection between the two systems so that Quitobaquito Springs could experience a delayed effect by an increase in ground water drawdown occurring in Mexico (Carruth 1996, p. 21). Discharge from Quitobaquito Springs has diminished by 42 percent over the past 35 years with 5,500 cf/day average discharge measured from 1981–1992 down to 3,157 cf/day measured from 2005–present (Carruth 1996, pp. 13, 21; Peter Holm, pers. comm., 2016). Reasons for this decrease are unknown.

Human demands on ground water in the Rio Sonoyta basin include agriculture and municipal use to support a growing population, both of which are almost wholly dependent on ground water. Irrigated agriculture is widespread in the Rio Sonoyta Valley, and continued development in the towns of Sonoyta and Lukeville is placing increased demands on limited ground water availability. Potential ground water use in the Rio Sonoyta watershed is greater than the estimated recharge rate. Based on total number of wells installed along the Rio Sonoyta, existing capacity for wells to withdraw water is six times the ground water recharge (Pearson and Connor 2000, p. 388). Although we do not have any recent observations of actual ground water use, we can assume that ground water pumping currently exceeds recharge based on negative trends of depth to ground water measured from 1992 to 2010 at Organ Pipe Cactus National Monument in wells that are close to the agricultural zone of Sonoyta, Sonora (OPCNM 2011, p. 8).

At Quitovac, there are five springs that provide water to the impounded pond. The pond at Quitovac is used for watering small numbers of livestock and irrigating fruit trees (Aguirre and Rosen 2003, p. 11; USFWS files). One of the five springs at Quitovac was not flowing into the pond

during a visit to the site in 2015 (D. Duncan, pers. obs., 2015). There has also been gold mining in the area surrounding Quitovac, and mine exploration and development continue, all of which require water. In addition, surface water diversion for agriculture has occurred in the past and is likely to continue into the future. The Quitovac population is in the Rio Guadalupe basin and, therefore, not likely affected by ground water pumping in the Rio Sonoyta. While ground water pumping could occur in this basin in the future, we currently have no information indicating the likelihood. Land management actions, such as dredging, also impact the Quitovac population. Partial dredging of the pond has occurred at least twice (Nabhan *et al.* 1982, p. 130; Nabhan 2008, p. 252; USFWS files). During a visit to the site on June 3, 2015, after the pond and spring heads had been completely excavated by dredging, only a single turtle with a damaged shell was found at the spring head (D. Duncan, pers. obs., 2015).

The surface water necessary for habitat of the subspecies generally is fed by ground water recharge. This recharge comes from infiltration of precipitation along mountain fronts and in ephemeral channels. However, drought conditions that have persisted for the past 20 years have likely contributed to decreased ground water recharge in the Rio Sonoyta basin and Rio Guadalupe basin. Decreased precipitation and increased evaporation related to increased duration of drought conditions have contributed to reduced surface water available to support the subspecies at all population sites. Climate model projections predict a shift to increasing dryness in the Southwest as early as 2021–2040 (Seager *et al.* 2007, p. 1181). Streamflow is predicted to decrease in the Southwest even if precipitation were to increase moderately (Nash and Gleick 1993, State of New Mexico 2005, Hoerling and Eischeid 2007) because warmer surface air temperatures lead to increased evaporation, increased evapotranspiration, and decreased soil moisture. These three factors would lead to decreased streamflow even if precipitation increased moderately (Garfin 2005, Seager *et al.* 2007). The effect of decreased

streamflow is that streams become smaller, intermittent, or dry, and thereby reduce the amount of habitat available for Sonoyta mud turtles. A smaller stream is affected more by air temperature than a larger one, exacerbating the effects of both warm and cold air temperatures (Smith and Lavis 1975). Although Sonoyta mud turtles evolved in an extremely arid climate and have survived drought in the past, it is anticipated that a prolonged, intense drought would affect all populations, in particular those occupying the Rio Sonoyta, which is likely to become entirely ephemeral.

Habitat for the subspecies requires riparian vegetation, which is also dependent on surface water and ground water recharge. When ground water discharge is of sufficient volume to saturate streamside areas, riparian vegetation develops. This occurrence also extends to manmade ponds created to capture ground water discharge. The extent and persistence of this vegetation depends on the depth to ground water. In the case of the perennial sections of the Rio Sonoyta as well as the ponds at Quitobaquito and Quitovac, riparian vegetation has established where its root systems can reach the alluvial ground water. The use of water by the riparian vegetation (evapotranspiration) is itself a discharge of ground water, and can even affect surface flow in the adjacent stream or surface level in a pond. Because ground water extraction in the Rio Sonoyta basin continues to reduce depth to ground water, riparian vegetation has likely been reduced in the Rio Sonoyta, and streamside areas are now occupied by drought-tolerant plants, which generally lack the same ecological value of riparian vegetation.

Riparian vegetation is associated with increased ecological site conditions; organic matter produced by plants is a major contributor to soil development, structure, and moisture. The below-ground component of riparian vegetation further enhances floodplain and bank water storage because root growth, and subsequent root decay, creates conditions that increase rates of infiltration of rainwater and floodwater, thereby enhancing ground water recharge and base-flow replenishment. Riparian vegetation, despite its own water use, also moderates the direct evaporation of water from a stream or

pond. Open water in Sonoyta mud turtle habitats likely exhibits relatively high evaporation compared to areas shaded by riparian overstory (Goodrich et al. 2000, pp. 292–293). Riparian vegetation surrounding water features provides essential habitat for all life stages of turtles. As riparian vegetation dies due to declining ground water, the physical and biological processes are reversed and a cascade of interconnected impacts begins. Dead trees decompose and no longer stabilize floodplain soils, which are then readily eroded away. The loss of floodplain soils and their ability to store flood waters reduces the gradual release of post-flood infiltrated water back to the stream, further reducing surface flows. Reductions in riparian habitat will also decrease subsurface moisture needed for nesting sites; drought refuge for hatchlings, juvenile and adult turtles; and shelter from large flooding events for juvenile and adult turtles. Decreased riparian vegetation will lead to deterioration of the microclimate that provides soil moisture to nest sites and burrows. (See Section 4.2 and Appendix A of the SSA Report).

In addition to loss of habitat associated with ground water pumping and drought in the Rio Sonoyta basin, changes to wastewater infrastructure in the town of Sonoyta have reduced surface water available in the Xochimilco reach of the Rio Sonoyta, but increased habitat for the subspecies in the Sonoyta sewage lagoon. Most of the wastewater that used to be discharged directly into the Xochimilco reach and provided a constant source of surface water that maintained perennial flow in this reach is now redirected to the Sonoyta sewage lagoon. Wastewater runoff is now likely limited to individual homesteads. Consequently, surface water available for Sonoyta mud turtles is greatly reduced in the Xochimilco reach of the Rio Sonoyta. It is likely that there is always a small pool of water in or near the dam site at Xochimilco, either from springs or urban wastewater from individual homesteads atop the arroyo wall. When wastewater that used to contribute surface water to the Xochimilco reach was redirected to the Sonoyta sewage lagoon, the amount of perennial water for Sonoyta mud turtles increased at the lagoon.

Sonoyta mud turtles continue to persist at the Sonoyta sewage lagoon, and this site is not subject to effects of ground water withdrawal and drought due to a consistent inflow of wastewater. The Sonoyta sewage lagoon is within the floodplain of the Rio Sonoyta, and might contribute some level of recharge to the Rio Sonoyta basin through seepage and outflow. There is a high likelihood that the sewage lagoon in the town of Sonoyta will be replaced by a new wastewater treatment plant about 2.4 km (1.5 mi) northwest of the existing sewage lagoon in the next few years. Efforts will be made to translocate as many Sonoyta mud turtles as possible to the new wastewater facility from the sewage lagoon; however, it is unknown what amount this will be. The new wastewater treatment plant will serve an additional 35 percent of the town of Sonoyta's residences and will, therefore, be larger overall. However, the habitat available to Sonoyta mud turtles will be reduced by more than 75 percent. There will be a greater number of lagoons at the new wastewater treatment plant, but only one will be unlined and provide habitat for the Sonoyta mud turtle. Lining precludes the development of habitat for Sonoyta mud turtles including aquatic and riparian vegetation (See Figure 3.2.1 of the SSA Report). This unlined pond will provide less than 25 percent of the habitat that is currently present at the Sonoyta sewage lagoon.

Effluent flowing through the new wastewater treatment facility will be discharged into the Rio Sonoyta. This activity could improve recharge of ground water and create perennial flow in the river immediately downstream of the new wastewater treatment plant, which in turn would provide additional habitat to the subspecies, although the extent is unknown. Based on the persistence of turtles at the Sonoyta sewage lagoon and increased wastewater volume to the new wastewater treatment plant, we would expect that turtles at the new wastewater treatment plant would also persist. Overall, wastewater from the town of Sonoyta will continue to provide a perennial water source that should continue to

support one population of the Sonoyta mud turtle; however, since the available habitat is reduced by more than 75 percent, the population size will likely be reduced.

Reduced surface water and associated decrease in riparian vegetation, regardless of the cause, shrinks overall habitat amount and quality causing crowding and increased competition for limited resources (Stanila 2009 p. 45). Lack of surface water for a short time outside the typical dry season may be endured by individual Sonoyta mud turtles periodically, but multiple years without sufficient perennial water will reduce fitness and increase mortality. Sonoyta mud turtles in drying pond habitats or low surface water reaches will burrow in banks to escape desiccation for a short period of time. After time, burrows themselves may become too dry, turtles will lose fat reserves due to lack of foraging opportunity, females may not have viable eggs due to lack of nutrition and fat reserves, and eventually turtles will die from either starvation or desiccation. Potential population level impacts from reduced surface water and drought include lower reproductive rates, reduced recruitment, reduced population growth rate, or changes in distribution.

Decreasing availability of prey is another factor tied to surface water availability and corresponding loss of habitat that may impact the subspecies. We have very limited information on prey availability for the known populations of mud turtles. However, a reduction in surface water will impact the amount of aquatic invertebrate prey available and result in increased competition for prey. Aquatic invertebrates, the primary food source for Sonoyta mud turtles, need surface water and emergent vegetation to survive and complete their life-history functions. Water permanence will affect the diversity of invertebrate prey available for mud turtles, with ephemeral habitats having lower invertebrate diversity than intermittent or perennial habitats (Stanila 2009, p. 38). A reduction in water and emergent vegetation due to ground water pumping will reduce the amount of aquatic invertebrate prey for Sonoyta mud turtles. Adequate prey allows juvenile turtles to grow rapidly before becoming

adults and allows adults to have sufficient lipid content to support reproduction. Poor body condition (i.e., low lipids) may be associated with lower clutch size (total number of eggs produced) and, therefore, lower population growth (Rosen and Lowe 1996, pp. 40–43).

There are also native fish at Quitobaquito that may compete with turtles for invertebrate prey. Stomach analysis of turtles at Quitobaquito revealed animals were primarily consuming young shoots of bulrush even though benthic invertebrates were present in the aquatic system. Rosen and Lowe (1996, pp. 32, 41) thought that turtles may not be consuming invertebrates due to competition with native subspecies of desert pupfish (*Cyprinodon macularius eremus*) found at Quitobaquito. Desert pupfish are well known to feed on many of the same invertebrates that Sonoran mud turtles consume (Rosen and Lowe 1996, p. 41). Pupfish densities at Quitobaquito are similar or greater than the density used in an experimental pond study that demonstrated strong effects of desert pupfish on aquatic invertebrate abundance, so that competition between Sonoyta mud turtles and desert pupfish is plausible (Rosen and Lowe, p. 41).

Similarly, like competition with desert pupfish, the establishment of nonnative aquatic vertebrate species may also affect future persistence of the Sonoyta mud turtle. Currently two of the five populations of Sonoyta mud turtles exist with some nonnative species present. Black bullheads and western mosquitofish were introduced to the Rio Sonoyta Papalote reach, and blue tilapia were introduced at Quitovac. These species are now established at these two sites (Rosen *et al.* 2010, pp. 153–154; Minkley et al 2013, p. 289). All of these fish species likely compete with Sonoyta mud turtles for benthic invertebrates or alter the invertebrate community so that benthic invertebrates are reduced. Other nonnative aquatic species including American bullfrogs (*Lithobates catesbeianus*), crayfish (*Orconectes* spp. and *Cherax* spp.), large sunfish (centrarchids), and exotic turtles such as red-eared sliders (*Trachemys scripta elegans*) are not currently present in areas occupied

by the Sonoyta mud turtle, but could be released and become established, as they have been in many Sonoran mud turtle populations in the United States (Fernandez and Rosen 1996, pp. 39–41; Hensley *et al*. 2010, pp. 175–176; Drost *et al*. 2011, p. 33).

Bullfrogs, crayfish, large sunfish and catfish (ictalurids) are known to prey upon hatchling and juvenile Sonoran mud turtles. Crayfish, in particular, could decimate a population if introduced (Fernandez and Rosen 1996, pp. 41–43; Hensley *et al*. 2010, pp. 186–187). In addition, crayfish, African cichlid fishes including tilapia, western mosquitofish, and exotic turtles may also disrupt the food chain, which could alter the invertebrate community (Taylor et al. 1984, pp. 330–331; Fernandez and Rosen 1996, pp. 39-40; Duncan 2013, p. 1). This, in turn, could decrease type and amount of benthic invertebrate prey available to Sonoyta mud turtles (Fernandez and Rosen 1996, pp. 39–40) (See Section 4.4 and Appendix A of the SSA Report). In addition, turtles isolated in pools as a result of decreased surface water availability may be subject to increased predation from nonnative aquatic predators. Although we cannot specifically quantify effects to Sonoyta mud turtle populations now or in the immediate future we are highly confident that nonnatives are impacting the Papalote and Quitovac populations as described above. In addition, it is possible that in the near future the remaining three populations could become infested with the nonnative species listed above.

In summary, ground water withdrawal and changes to wastewater infrastructure are highly likely to continue into the immediate future and to negatively affect base flow that supports three populations of the Sonoyta mud turtle basin. There is also the potential that Quitovac may be impacted by ground water losses in the future, although we are highly uncertain of this outcome. The sewage lagoon and new wastewater treatment plant are not likely to be impacted by ground water pumping, and may actually contribute to ground water recharge of the Rio Sonoyta. Ongoing and future drought periods are likely to continue and will affect the availability of water in both the United States and Mexico (See

Section 4.1 and Appendix A of the SSA Report). In addition, drought is likely to be exacerbated by future climate change, decreasing water availability and increasing evapotranspiration losses.

Effects from climate change are expected to impact all but one population of Sonoyta mud turtles (the sewage lagoon). Although we cannot specifically quantify effects to available surface water, we are highly confident that there will be a reduction in surface water due to ground water pumping and changes to wastewater infrastructure in addition to impacts from climate change. This reduction in surface water reduces or in some populations could eliminate habitat Sonoyta mud turtles need to survive desiccation or complete life-history functions as described above. Our assessment of water reduction in the SSA Report indicates that water loss is an immediate and high-magnitude threat to the species. Quitovac is likely to undergo partial dredging again (and possibly complete dredging), and nonnatives are likely to be introduced again. Nonnatives are still present in the Papalote reach, and it is likely, based on the spread of nonnatives, that all sites could receive nonnative species in the immediate future.

Management actions undertaken by the National Park Service and Quitobaquito Rio Sonoyta Working Group have ameliorated many of the risks to the single Sonoyta mud turtle population in the United States at Organ Pipe Cactus National Monument, and, as explained below, these actions are expected to continue. The Quitobaquito Rio Sonoyta Working Group consists of biologists and managers from the National Park Service (NPS), Arizona Game and Fish Department, FWS, University of Arizona, Arizona Sonora Desert Museum, the National Commission of Natural Protected Areas in Mexico, and private citizens interested in conservation of aquatic native species in the Rio Sonoyta basin of Arizona and Sonora. Organ Pipe Cactus National Monument has already implemented numerous conservation measures recommended for the Sonoyta mud turtle by the Quitobaquito Rio Sonoyta Working Group. Since the 1970's the NPS has implemented conservation measures including trucking

water, spring renovation, strengthening the dike that keeps water in the pond, re-lining parts of the pond, and removing bulrush, that have benefited the Quitobaquito population. Efforts by Organ Pipe Cactus National Monument eventually resulted in water levels in the pond stabilizing near historical norms.

One risk that cannot be addressed at Organ Pipe Cactus National Monument is diminishing spring flow that supplies water to Quitobaquito Pond, as the cause is still unknown. (See Section 4.5 of the SSA Report). Per the National Park Service Organic Act (16 U.S.C. 1—4), the Organ Pipe Cactus National Monument will survey for, protect, and strive to recover all species native to national park system units. Based on their past conservation efforts at Quitobaquito, the NPS will continue conservation efforts to maintain water at Quitobaquito pond, to the extent within their power, as they have done since the 1950s and protect the Sonoyta mud turtle as they have since the late 1980s as this is a native species. Further, the endangered desert pupfish and designated critical habitat co-occurs with the Sonoyta mud turtle within the Quitobaquito pond. Some conservation actions to protect the desert pupfish and critical habitat will also protect the Sonoyta mud turtle and its aquatic habitat, as well as some of the riparian habitat surrounding Quitobaquito Springs.

Quitobaquito Rio Sonoyta Working Group management actions in Mexico have included defining the ecological status and distribution of the Sonoyta mud turtle in Sonora, creating new habitat to replace lost habitat, removing nonnative aquatic species, and outreach. Primary actions included nonnative removal and fencing to prevent livestock. However, the fencing has been removed and nonnatives have been reintroduced by the locals. These management actions have not addressed most of the risks to the four populations of the Sonoyta mud turtle in Mexico (See Section 4.5, Management Actions, of the SSA Report). The Quitobaquito and Rio Sonoyta Working Group has been developing a conservation assessment and conservation agreement for five aquatic species for a number of years.

This agreement is meant to promote the conservation of a number of species dependent on the aquatic and riparian habitats of the Rio Sonoyta watershed. The agreement would take the form of a Candidate Conservation Agreement. The Sonoyta mud turtle is a species listed in the conservation agreement; it would benefit from the conservation actions proposed. It is unclear when this agreement will be finalized.

In the SSA, we described the viability of the species in a way that characterizes the needs of the species in terms of resiliency, redundancy, and representation. Resiliency is having sufficiently large populations for the species to withstand stochastic events. Stochastic events are those events arising from random factors such as fluctuations in water levels, habitat modification, or introduction of nonnative predators. Redundancy is having a sufficient number of populations for the species to withstand catastrophic events. A catastrophic event is a rare destructive event or episode involving one or more populations and occurring suddenly. Representation is having the breadth of genetic and ecological diversity for the species to adapt to changing environmental conditions. In the SSA Report, populations of the Sonoyta mud turtle having a low level of resiliency are not considered to contribute to the redundancy and representation of the subspecies due to low probability that the populations will persist.

Currently, we consider the Quitobaquito and Sonoyta sewage lagoon populations of the Sonoyta mud turtle to have high resiliency, the Papalote reach population to have moderate resiliency, and the Xochimilco reach and Quitovac populations to have low resiliency. The Quitobaquito population occurs in an area of relatively good habitat and exhibits high survivorship among all age classes with increasing recruitment of juveniles. Resiliency of the four populations in Mexico is less certain as habitat has been greatly reduced in the Papalote and Xochimilco reaches, survivorship among age classes is unknown at the Sonoyta sewage lagoon due to lack of any surveys, and survivorship among age classes is unknown

at Quitovac due to recent dredging of all of the aquatic habitat available for mud turtles. Current abundance of mud turtle populations in Mexico is unknown, and we have low confidence that numbers have remained stable.

The viability of the Sonoyta mud turtle depends on maintaining multiple resilient populations over time. The resiliency of Sonoyta mud turtle populations depends on surface water availability, amount of riparian habitat and benthic invertebrates, and absence of nonnative competitors and predators. We expect the five extant Sonoyta mud turtle populations to experience changes to all of these aspects of their habitat, although it may be in different ways under the different conditions. Given our uncertainty regarding when habitats of the Sonoyta mud turtle will experience a reduction or elimination of surface water and corresponding loss of riparian habitat in the future, we forecasted future conditions of the Sonoyta mud turtle under three future plausible scenarios over three time periods (Chapter 5 of the SSA Report). These scenarios focus on surface water availability because this is the driving factor for the other variables impacting Sonoyta mud turtle populations—riparian habitat and prey. For example, if there is a somewhat reduced amount of surface water there would be a reduced amount or reduced quality of riparian area and prey. These factors in turn impact reproduction and recruitment, which drive the population growth. The three scenarios were:

(1) Best Case—All habitats occupied by Sonoyta mud turtle experience **no measurable drop** in surface water and nonnatives are absent.

(2) Moderate Case—Surface water in habitats occupied by Sonoyta mud turtle is **somewhat reduced but not eliminated,** and nonnatives remain at status quo.

(3) Worst Case—All surface water at sites occupied by Sonoyta mud turtle is **extremely reduced or eliminated**, and nonnatives are present in all populations.

We selected three useful timeframes for our forecasting: 7 years, 35 years, and 70 years. We chose 7 years based on the area's drought cycle, 35 years because it incorporates both the maximum lifespan of the species and the mid-century climate projections for the southwestern United States, and 70 years because it is within the range of the available drought and climate change model forecasts and is about twice the maximum lifespan of the species (Lenart 2008, entire; Stritthold *et al*. 2012, entire; Garfin *et al*. 2013, entire; P. Holms, 2016, pers. comm.). Within these timeframes, we considered the three different scenarios that spanned a range of potential conditions that we believe are important influences on the status of the species, and our results describe this range of possible conditions in terms of our projections of how many and where Sonoyta mud turtle populations will persist into the near term.

We assessed the moderate-case scenario as the most likely to occur because this scenario is based on the threats identified above continuing at their current intensity and scale through the various time steps. This scenario projected the current level of stressors associated with the status quo conditions. The moderate-case scenario was the most likely to occur, as explained in the SSA. While full analyses of all scenarios are available in the SSA report, we are only presenting the full results of the moderate-case scenario here because it gives the most realistic projection of the future condition of the subspecies. The worst-case scenario was not found to be very likely because, as explained in the SSA, it is unlikely that all populations will lose all or most of their surface water. Conversely, the best-case scenario of improving conditions was found not to be very likely to occur because this scenario projected no reduction in surface water, which is an unlikely and unrealistic scenario given current climate change projections. Please refer to the SSA report (Service 2016, Chapter 5) for the full analysis of future scenarios.

Under the moderate-case scenario within the 7-year timeframe, we expect the Sonoyta mud turtle's viability to be characterized by lower levels of resiliency, representation, and redundancy than it has currently, which is already reduced as described above. We expect populations at Xochimilco reach and Quitovac to have low population resiliency. In addition, we expect the Sonoyta sewage lagoon to have low population resiliency and its possible extirpation within 7 years. This possible outcome is dependent on exactly when the new wastewater treatment plant begins operating, which will replace the Sonoyta sewage lagoon. The new population at the new wastewater treatment plant will be stocked with animals from the Sonoyta sewage lagoon population. However, aquatic habitat at the new wastewater treatment plant is smaller than the sewage lagoon, and riparian habitat will essentially be nonexistent at first, so the population resiliency at the wastewater treatment plant is expected to be only moderate at the 7-year time step, whereas, the Sonoyta sewage lagoon currently has high population resiliency.

We anticipate the population at Quitobaquito will be highly resilient and the Papalote reach will be moderately resilient at this time step. We expect the three populations with low resiliency, Sonoyta sewage lagoon, Xochimilco reach, and Quitovac, will have only some or few individuals that can complete life functions and breed successfully, and the populations are decreasing and not able to withstand stochastic events. Further, it is possible that one of the low-resiliency populations, Sonoyta sewage lagoon, will be extirpated by this time. Two of the three remaining populations are projected to be moderately resilient and will occur in highly managed habitats—the Quitobaquito population with a spring-fed pond and the wastewater treatment plant that is maintained by wastewater effluent. The Santo Domingo population is considered extirpated. We expect representation and redundancy will also be substantially reduced due to the three populations of low resiliency being functionally extirpated. This leaves three populations with only one being highly resilient and two being moderately resilient,

including the wastewater treatment plant, which will be reduced in size from the sewage lagoon it is replacing.

Table 2.—Rio Sonoyta mud turtle current and near-future population condition.

Country	Population Name	Current Condition	Moderate-Case Scenario 7-year time step
United States	Quitobaquito	High	High
Mexico	Papalote Reach (Agua Dulce)	Moderate	Moderate
	Sonoyta Sewage Lagoon	High	Low
	New Sonoyta wastewater treatment plant	Ø	Moderate
	Xochimilco Reach (Sonoyta Reach)	Low	Low
	Quitovac	Low	Low
	Santo Domingo	Ø	Ø

Determination

Section 4 of the Act, and its implementing regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(b)(1)(a), the Secretary is to make endangered or threatened determinations required by section 4(a)(1) solely on the basis of the best scientific and commercial data available to her after conducting a review of the status of the species and after taking into account conservation efforts by States or foreign nations. The standards for determining whether a species is endangered or threatened are provided in section 3 of the Act. An endangered species is any species that is "in danger of extinction throughout all or a significant portion of its range." A threatened species is any species that is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." Per section 4(a)(1) of the Act, in reviewing the status of the species to determine if it meets the definition of endangered or of threatened, we determine whether any species is an

endangered species or a threatened species because of any of the following 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; and (E) other natural or manmade factors affecting its continued existence. Listing actions may be warranted based on any of the above threat factors, singly or in combination.

The fundamental question before the Service is whether the subspecies warrants protection as an endangered or threatened species under the Act. To make this determination, we evaluated extinction risk, described in terms of the current condition of populations and their distribution (taking into account the risk factors (i.e., threats, stressors) and their effects on those populations). For any species, as population conditions decline and distribution shrinks, the species' overall viability declines and extinction risk increases.

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the Sonoyta mud turtle. Currently, there are five extant populations, and all are significantly isolated from one another such that recolonization of areas previously extirpated or areas that may be extirpated is extremely unlikely. Expert input provided during the development of the SSA Report indicated that, under the current situation for the five currently occupied sites, connectivity or movement among the populations is a rare occurrence. The species' range has been reduced by 80 to 92 percent in the Rio Sonoyta (Factor A) in Mexico, and current distribution is limited to five populations in three ponds totaling <7 ha (<15.5 ac) and two perennial sections of the Rio Sonoyta totaling 1.5 to 5.5 km (0.9 to 3.4 mi). Two historical populations are extirpated due to loss of perennial water. There are two newly discovered extant populations in

addition to the three historical populations that remain. Only three of these populations are of sufficient resiliency to withstand stochastic events.

Habitat loss from anthropogenic ground water withdrawals and long-term drought is occurring rangewide and is likely to continue and increase in the near term (Factor A; Factor E). This reduction in water restricts the limited available habitat and decreases the resiliency of the Sonoyta mud turtle within those habitats. We find that ongoing drought is likely to continue and be exacerbated by climate change, decreasing water availability and increasing evapotranspiration losses (Factor A). This threat is ongoing, rangewide, and expected to increase in the future. Predation by nonnative aquatic species has occurred at two sites in Mexico, although there is uncertainty with regard to the population effects (Factor C). Predation by nonnative aquatic species has been shown to reduce recruitment and population size of other populations of Sonora mud turtle and it is likely to occur in Sonoyta mud turtle populations in the future. The Quitovac population's current habitat was just recently completely dredged, and the status of Sonoyta mud turtles is unknown. Partial dredging in the near term is likely based on past dredging activity. It is reasonably likely that a catastrophic event could occur anytime within the initial 7-year time step analyzed in the SSA Report and that current population resiliency and redundancy are inadequate to maintain population viability.

The implementation of the conservation measures by the National Park Service and the Quitobaquito Rio Sonoyta Working Group has resulted in maintaining the only Sonoyta mud turtle population in the United States and reduces the risk of loss of at least one population in Mexico. However, the conservation measures do not alleviate the threats that are influencing the resiliency, redundancy, and representation of the Sonoyta mud turtle across its range (as described above).

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

endangered throughout all or a significant portion of its range within the foreseeable future." Based on the information presented in the SSA Report for the Sonoyta mud turtle, and the discussion above, we find that the best available scientific and commercial information indicates that the Sonoyta mud turtle is presently in danger of extinction throughout its entire range based on the severity and immediacy of threats currently impacting the species. The overall range has been significantly reduced; the limited remaining habitat and populations are currently threatened by an increase in ground water pumping, which results in reduced spring flows and, therefore, reduced surface water. Reduced surface water results in reduced aquatic habitat for the subspecies where they spend the majority of their time and is needed to avoid desiccation. Further, the reduction in surface water impacts aquatic vegetation used by the Sonoyta mud turtle for cover and by their prey species. Lastly, the reduction in ground water reduces the soil moisture of the riparian area resulting in habitat that is too dry for Sonoyta mud turtles to use for estivation and nesting.

These factors acting in combination reduce the overall viability of the species. The risk of extinction is high because the five remaining populations are small, isolated, and have limited, if any, potential for recolonization. The estimated current and near-term future conditions of the known Sonoyta mud turtle populations as described in the SSA Report lead us to find that the condition and distribution of populations do not provide sufficient resiliency, redundancy, and representation for this subspecies; therefore, we find that the subspecies meets the definition of an endangered species under the Act. Accordingly, on the basis of the best available scientific and commercial information, we propose listing the Sonoyta mud turtle as endangered in accordance with sections 3(6) and 4(a)(1) of the Act.

Under the Act and our implementing regulations, a species may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. Because we have determined that the

Sonoyta mud turtle is endangered throughout all of its range, no portion of its range can be "significant" for purposes of the definitions of "endangered species" and "threatened species." See 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 37577, July 1, 2014).

We find that a threatened species status is not appropriate for the Sonoyta mud turtle because of the existing contracted range (loss of 80–92 percent of its historic range in Mexico) compared to the historical range, the primary threats are occurring rangewide and are not localized, and the threats are impacting the species now and are ongoing. We find the Sonoyta mud turtle to be in danger of extinction now.

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. Subsection 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 threats to its survival and

recovery. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning includes the development of a recovery outline shortly after a species is listed and preparation of a draft and final recovery plan. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. The recovery plan also identifies recovery criteria for review of when a species may be ready for downlisting or 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 Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribes, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (e.g., restoration of water availability and associated 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, and, in the case of the Sonoyta mud turtle, cooperation with our counterparts in Mexico. If this species is listed, funding for recovery actions will be available from a variety of sources, including Federal

budgets, State programs, and cost-share grants for non-Federal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the State of Arizona would be eligible for Federal funds to implement management actions that promote the protection or recovery of the Sonoyta mud turtle. Information on our grant programs that are available to aid species recovery can be found at: *http://www.fws.gov/grants*.

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

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

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 National Park Service (Organ Pipe Cactus National Monument); issuance of section 404 Clean Water Act permits by the Army Corps of Engineers; and

construction and maintenance of roads or highways by the U.S. Customs and Border Protection of the Department of Homeland Security.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to endangered wildlife. The prohibitions of section 9(a)(1) of the Act, codified at 50 CFR 17.21, make it illegal for any person subject to the jurisdiction of the United States to take (which includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these) endangered wildlife within the United States or on the high seas. In addition, it is unlawful to import; export; deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of commercial activity; or sell or offer for sale in interstate or foreign commerce any listed species. It is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. 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 wildlife under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22. With regard to endangered wildlife, a permit may be issued for the following purposes: for scientific purposes, to enhance the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities. 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 proposed listing on proposed and ongoing activities within the range of the species proposed for listing. At this time, we are unable to identify specific activities that would not be

considered to result in a violation of section 9 of the Act because the Sonoyta mud turtle sites where the species currently occurs are subject to a variety of potential activities, and it is likely that site-specific conservation measures may be needed for activities that may directly or indirectly affect the species. Additionally, most activities subject to consultation include direct effects to the species and/or the aquatic and riparian habitats to which it is inextricably tied. It is difficult to predict an activity already subject to consultation that would not result in anticipated take of individual Sonoyta mud turtles.

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

(1) Unauthorized handling or collecting of the species.

(2) Destruction/alteration of the species' habitat by discharge of fill material, draining, ditching, tiling, pond construction, stream channelization or diversion, removal or destruction of emergent aquatic vegetation; or diversion or alteration of surface or ground water flow into or out of the wetland (i.e., due to roads, impoundments, discharge pipes, stormwater detention basins, etc.) or in any body of water in which the Sonoyta mud turtle is known to occur.

(3) Direct or indirect destruction of riparian habitat.

(4) Introduction of nonnative species that compete with or prey upon the Sonoyta mud turtle, such as the introduction of nonnative fish and crayfish species.

(5) Release of biological control agents that attack any life stage of this species.

(6) Discharge of chemicals or fill material into any waters in which the Sonoyta mud turtle is known to occur.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Arizona Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Required Determinations

Clarity of the Rule

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

(1) Be logically organized;

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

(3) Use clear language rather than jargon;

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

(5) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in **ADDRESSES**. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

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

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

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.

Based on cultural claims maps and reservation boundaries we have on file, the distribution of the Sonoyta mud turtle overlaps areas that may be of interest to the following tribes: Tohono O'odham Nation, Quechan Tribe, Hopi Tribe, Colorado River Indian Tribes, and Cocopah Indian Tribe. On November 20, 2015, we notified these tribes via letter of our intent to conduct a status assessment for the purpose of determining whether the subspecies warrants protection under the Act. In our letter we offered to meet with the tribe to discuss the process, potential impacts to the tribes, and how tribal information may be used in our assessment. In addition, we requested any information they have regarding the subspecies. To date we have not received a response from these any of these tribes. Upon publication of this proposed rule we will send notification letters to these tribes and again extend an invitation to meet and discuss.

References Cited

A complete list of references cited in this rulemaking is available in the SSA Report (U.S. Fish and Fish and Wildlife Service. 2016. Species status assessment report for the Sonoyta mud turtle (*Kinosternon sonoriense longifemorale*), Version 1.0. Albuquerque, NM) that is available on the Internet at *http://www.regulations.gov* at Docket Number FWS–R2–ES–2016–0103, at *https://www.fws.gov/southwest/es/arizona/*, and upon request from the Arizona Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

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

List of Subjects in 50 CFR Part 17

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

Proposed Regulation Promulgation

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

PART 17—[AMENDED]

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

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

2. In § 17.11(h), add an entry for "Turtle, Sonoyta mud" to the List of Endangered and Threatened Wildlife in alphabetical order under REPTILES to read as set forth below:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Common Name	Scientific Name	Where Listed	Status	Listing Citations and Applicable Rules
* * * * * * *				
REPTILES				
* * * * * * *				
Turtle, Sonoyta mud	*Kinosternon sonoriense longifemorale*	Wherever found	E	[**Federal Register** citation when published as a final rule]
* * * * * * *				

Dated: September 7, 2016

Stephen Guertin

Acting Director, U.S. Fish and Wildlife Service.

Billing Code 4333–15

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