Appendix D | **USFWS Correspondence**

Appendix D1 | **USFWS's Proposed Rule for the Blindcats**

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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R2–ES–2023–0069; FF09E21000 FXES1111090FEDR 234]

RIN 1018–BE77

Endangered and Threatened Wildlife and Plants; Endangered Species Status for Toothless Blindcat and Widemouth Blindcat

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to list the toothless blindcat (*Trogloglanis pattersoni*) and widemouth blindcat (*Satan eurystomus*), two cavefish species from the Edwards Aquifer in Bexar County, Texas, as endangered species under the Endangered Species Act of 1973, as amended (Act). This determination also serves as our 12-month finding on a petition to list the toothless blindcat and widemouth blindcat. After a review of the best available scientific and commercial information, we find that listing both species is warranted. If we finalize this rule as proposed, it would extend the Act's protections to these species. We have determined that designation of critical habitat is not prudent.

DATES: We will accept comments received or postmarked on or before October 23, 2023. Comments submitted electronically using the Federal eRulemaking Portal (see **ADDRESSES**, below) must be received by 11:59 p.m. eastern time on the closing date. We must receive requests for a public hearing, in writing, at the address shown in **FOR FURTHER INFORMATION CONTACT** by October 6, 2023.

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

(1) *Electronically:* Go to the Federal eRulemaking Portal: *https://www.regulations.gov.* In the Search box, enter FWS–R2–ES–2023–0069, which is the docket number for this rulemaking. Then, click on the Search button. On the resulting page, in the panel on the left side of the screen, under the Document Type heading, check the Proposed Rule box to locate this document. You may submit a comment by clicking on ''Comment.''

(2) *By hard copy:* Submit by U.S. mail to: Public Comments Processing, Attn: FWS–R2–ES–2023–0069, U.S. Fish and Wildlife Service, MS: PRB/3W, 5275 Leesburg Pike, Falls Church, VA 22041–3803.

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

Availability of supporting materials: Supporting materials, such as the species status assessment report, are available at *https://www.regulations.gov* at Docket No. FWS–R2–ES–2023–0069.

FOR FURTHER INFORMATION CONTACT: Karen Myers, Field Supervisor, U.S. Fish and Wildlife Service, Austin Ecological Services Field Office, 1505 Ferguson Lane, Austin, TX 78754; telephone 512–937–7371. Individuals in the United States who are deaf, deafblind, hard of hearing, or have a speech disability may dial 711 (TTY, TDD, or TeleBraille) to access telecommunications relay services. Individuals outside the United States should use the relay services offered within their country to make international calls to the point-of-contact in the United States.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, a species warrants listing if it meets the definition of an endangered species (in danger of extinction throughout all or a significant portion of its range) or a threatened species (likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range). If we determine that a species warrants listing, we must list the species promptly and designate the species' critical habitat to the maximum extent prudent and determinable. We have determined that the toothless blindcat and widemouth blindcat both meet the definition of an endangered species; therefore, we are proposing to list both as such. Listing a species as an endangered or threatened species can be completed only by issuing a rule through the Administrative Procedure Act rulemaking process (5 U.S.C. 551 *et seq.*).

What this document does. We propose to list the toothless blindcat and the widemouth blindcat as endangered species under the Act.

The basis for our action. Under the Act, we may determine that a species is an endangered or threatened species because of any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We have determined that the toothless blindcat and widemouth blindcat are endangered due to the threat of mortality from groundwater well pumping (Factor E).

The toothless blindcat and the widemouth blindcat occupy a limited range, and populations of both species have likely been severely reduced since the introduction of groundwater wells in the late 19th to early 20th centuries. The lethal discharge of the species through groundwater wells could potentially impact the populations directly, with an estimated cumulative loss of thousands of individuals. Additionally, the assumed life history traits (such as increased age at first reproduction, lower numbers of reproductively active females, reduced numbers of eggs, slower growth rates, and longer life spans) of both species make them more susceptible to long-term impacts on demographic structure in the form of lower numbers of sexually mature fish, reduced reproductive output, and diminished recruitment of younger individuals.

Section 4(a)(3) of the Act requires the Secretary of the Interior (Secretary), to the maximum extent prudent and determinable, to designate critical habitat concurrent with listing. We have determined that designating critical habitat for the toothless blindcat and widemouth blindcat is not prudent because the main driver of both species' status is direct mortality resulting from groundwater well pumping (Factor E). The wells constructed in blindcat habitat are not affecting the species through habitat destruction or modification; instead, it is the capture, entrainment, and death of individuals due to uptake from groundwater well pumping that threatens the species. Since we have determined that the present or threatened destruction, modification, or curtailment of both species' habitats or range is not a threat to the toothless blindcat or the widemouth blindcat, we determine that designation of critical habitat is not prudent for the species.

Information Requested

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or

information from other 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 species' biology, ranges, 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 ranges, including distribution patterns and the locations of any additional populations of these species;

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

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

(2) Threats and conservation actions affecting these species, including:

(a) Factors that may be affecting 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.

(b) Biological, commercial trade, or other relevant data concerning any threats (or lack thereof) to these species.

(c) Existing regulations or conservation actions that may be addressing threats to these species.

(3) Additional information concerning the historical and current status of these species.

(4) Information regarding our determination that designating critical habitat for the toothless blindcat and widemouth blindcat is not prudent.

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

Please note that submissions merely stating support for, or opposition to, the action under consideration without providing supporting information, although noted, do not provide substantial information necessary to support a determination. Section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or a threatened species must be made solely on the basis of the best scientific and commercial data available, and section 4(b)(2) of the Act directs that the Secretary shall designate critical habitat on the basis of the best scientific data available.

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

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

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

Our final determinations may differ from this proposal because we will consider all comments we receive during the comment period as well as any information that may become available after this proposal. Based on the new information we receive (and, if relevant, any comments on that new information), we may conclude that one or both of these species is threatened instead of endangered, or we may conclude that one or both of these species does not warrant listing as either an endangered species or a threatened species. In our final rule, we will clearly explain our rationale and the basis for our final decisions, including why we made changes, if any, that differ from this proposal.

Public Hearing

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

Previous Federal Actions

We identified the toothless blindcat and widemouth blindcat as category 2 candidates in our December 30, 1982, candidate notice of review (CNOR) (47 FR 58454). Category 2 candidates were defined as taxa for which we had information indicating that proposing to list the species was possibly appropriate, but for which substantial data were not available to biologically support a proposed rule. Both species remained so designated in subsequent CNORs (50 FR 37958, September 18, 1985; 54 FR 554, January 6, 1989; 56 FR 58804, November 21, 1991; 59 FR 58982, November 15, 1994). In our February 28, 1996, CNOR (61 FR 7596), we discontinued the designation of category 2 species as candidates; therefore, the toothless blindcat and widemouth blindcat were no longer candidate species.

In August 1995, we received a petition from the American Society of Ichthyologists and Herpetologists (ASIH) and the Desert Fishes Council. The petition was to list three species, including the toothless blindcat and widemouth blindcat (ASIH 1995, entire). Subsequently, in 1998, we published a 90-day finding that the petition did not present substantial information indicating that these species warranted listing (63 FR 48166; September 9, 1998).

On June 25, 2007, we received a petition dated June 18, 2007, from Forest Guardians (now WildEarth Guardians) to list 475 species, including the toothless blindcat and widemouth blindcat, in the southwestern United States as endangered or threatened species and to designate critical habitat under the Act (Forest Guardians 2007, entire). On December 16, 2009, we published a partial 90-day finding (74 FR 66866) on 192 species from that petition; in that document, we announced that the petition presented substantial information that listing the toothless blindcat and widemouth blindcat may be warranted.

Peer Review

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

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), and our August 22, 2016, memorandum updating and clarifying the role of peer review of listing actions under the Act,

we solicited independent scientific review of the information contained in the toothless blindcat and widemouth blindcat SSA report (Service 2022, entire). We sent the SSA report to six independent peer reviewers and received four responses. Results of this structured peer review process can be found at *https://www.regulations.gov* under Docket No. FWS–R2–ES–2023–0069. In preparing this proposed rule, we incorporated the results of these reviews, as appropriate, into the SSA report, which is the foundation for this proposed rule.

Summary of Peer Reviewer Comments

As discussed in Peer Review, above, we received comments from four peer reviewers on the draft SSA report. We reviewed all comments we received from the peer reviewers for substantive issues and new information regarding the content of the SSA report. The peer reviewers generally concurred with our methods and conclusions, and provided additional information, clarifications, and suggestions to improve the SSA. One peer reviewer questioned assumptions related to groundwater well mortality and habitat connectivity. Our review of the best available information regarding the impact of anthropogenic mortality (such as well mortality) on fish species similar to the toothless and widemouth blindcats (that is, fish species that are subterranean, are long-lived, and have reduced reproductive capacity) supports the findings of the SSA.

I. Proposed Listing Determination

Background

A thorough review of the taxonomy, life history, and ecology of the toothless blindcat (*Trogloglanis pattersoni*) and widemouth blindcat (*Satan eurystomus*) is presented in the SSA report (Service 2022, entire).

The toothless blindcat and widemouth blindcat are cavefish endemic to the San Antonio segment of the Edwards Aquifer in Bexar County, Texas. They inhabit a deep, inaccessible subterranean region of the aquifer, with all known specimens of both species having been collected from groundwater wells at depths at or greater than 308 meters (m) (1,010 feet (ft)). The toothless blindcat and the widemouth blindcat are members of the catfish (Siluriformes) family Ictaluridae, and are the only members of their respective genera, *Trogloglanis* and *Satan* (Arce-H et al. 2017, pp. 406–407, 415).

The toothless blindcat and widemouth blindcat occur in a very deep portion of the San Antonio segment of the Edwards Aquifer, where they can likely move through the groundwater flowing through a system of interconnected subterranean conduits (Ford and Williams 2007, pp. 103–106, 112–114; Culver and Pipan 2009, pp. 5–8; Veni 2012, pp. 603–608; White 2012, pp. 383–386). These caves and conduits are formed in the rock layers of the Edwards Aquifer through dissolution by groundwater (Livingston et al. 1936, pp. 72–73; Petitt and George 1956, p. 16; Maclay and Small 1986, p. 61).

Due to their deep subterranean habitat, the toothless blindcat and widemouth blindcat exhibit several stygomorphic (adaptations to subterranean conditions) characteristics, including depigmentation, absence of fully developed eyes, and short lateral line canals (Lundberg 1982, pp. 77–78; Langecker and Longley 1993, pp. 978–980; Lundberg et al. 2017, pp. 163–164). Blindcats lack scales and possess eight barbels (whisker-like sensory organs) arranged around the snout and mouth (Eigenmann 1919, p. 398; Hubbs and Bailey 1947, pp. 5, 10; Lundberg 1982, p. 16; Burr et al. 2020, p. 42). The toothless blindcat and widemouth blindcat appear to be among the smallest known catfishes, reaching total lengths of up to 103.8 millimeters (mm) (4.1 inches (in)) and 136.9 mm (5.4 in), respectively (Hubbs and Bailey 1947, pp. 8–10, 12–14; Suttkus 1961, pp. 62–63; Lundberg 1982, pp. 10–11; Langecker and Longley 1993, p. 977; Burr et al. 2020, p. 26).

The toothless blindcat lacks teeth, and its jaw is thin and papery with a funnel-like mouth positioned ventrally below the snout (Hubbs and Bailey 1947, pp. 5, 11–12; Lundberg 1982, pp. 15–16). The widemouth blindcat possesses well-developed teeth, a robust jaw, and a larger mouth positioned transversely at the depressed and flat snout (Hubbs and Bailey 1947, p. 5). From their jaw and mouth morphology, as well as specimen stomach contents, we infer that the toothless blindcat is a detrivore that feeds on biofilm and other organic material, whereas the widemouth blindcat is likely an opportunistic predator capable of taking sizeable prey (Longley and Karnei 1978a, pp. 31, 34; Lundberg et al. 2017, pp. 160, 162).

There is documentation of toothless blindcat individuals being expelled from eight wells and widemouth blindcat individuals from five wells, with overlapping expulsions at two wells (Zara Environmental 2020, pp. 11–12; Diaz 2021, p. 30). Wells that have produced the species are relatively close, with an average distance between wells of 4.5 kilometers (km) (2.8 miles (mi)) for the toothless blindcat and 6.3 km (4.0 mi) for the widemouth blindcat (Service 2022, p. 45). Given the potential for hydrogeological connectivity, the species likely exist as single sympatric subterranean populations. Well depth ranges from 308 m (1,010 ft) to 582 m (1,909 ft) (Zara Environmental 2020, pp. 14–23), making these species some of the deepest known cavefish (Trajano 2001, p. 140; Fišer et al. 2014, p. 976). These wells are distributed along a southwest to northeast trending line through Bexar County, roughly paralleling the southeastern boundary of the aquifer's artesian zone. The artesian zone of the Edwards Aquifer is where hydraulic pressure of groundwater forces water to the surface, where the water escapes through springs, seeps, or wells drilled into the aquifer (Lindgren et al. 2004, pp. 35, 39–40).

The southeastern extent of the artesian zone represents the limit of freshwater in the Edwards Aquifer (Hovorka et al. 1995, p. 3; Sharp and Smith 2019, pp. 151–152). Groundwater from the aquifer's artesian zone is considered high-quality with low dissolved solids ranging from 300 to 500 milligrams/liter (mg/l) (Petitt and George 1956, p. 76; Maclay et al. 1980, p. 8). To the southeast of the artesian zone, dissolved solids increase and the groundwater becomes progressively more saline (Groschen 1993, pp. 2, 7; Groschen and Buszka 1997, pp. 1–3). The contact point where freshwater (*i.e.,* <1,000 mg/l dissolved solids) generally meets saline water (*i.e.,* >1,000 mg/l) is termed the ''freshwater/saline-water interface'' (Arnow 1959, p. 40; Maclay et al. 1980, p. 10; Groschen 1993, p. 2; Groschen and Buszka 1997, pp. 1, 3). All wells where blindcats have been expelled occur just to the northwest of the freshwater/saline-water interface on the freshwater side.

Neither blindcat species has ever been directly observed in its natural subterranean habitat, but we can infer the species' needs from their location and from the life-history of other cavefish species. Subterranean habitat for the toothless blindcat and widemouth blindcat appears to be centered in an area of greater aquifer permeability in Bexar County (Maclay 1995, pp. 26–27; Hovorka et al. 1996, pp. 50, 54–57; Hovorka et al. 2004, p. 19). Concentrated groundwater flow in this area has likely resulted in the formation of enlarged faults, fractures, and cavernous openings that provide suitable physical habitat for the blindcats (Lindgren et al. 2004, pp. 16).

The area along the freshwater/saline-water interface is likely an area of focused groundwater movement due to

greater porosity and permeability in that area (Maclay and Small 1986, p. 66; Hovorka et al. 1996, pp. 50, 54–57; Worthington 2003, pp. 16, 20, 23–24; Hovorka et al. 2004, pp. 19, 42; Lindgren et al. 2004, pp. 11, 15, 17–21, 26). We infer the importance of this location for these species from the hydraulic connectivity and the existence of aquifer food resources at great depth near this interface (Birdwell and Engel 2009, pp. 153–155; Engel and Randall 2011, pp. 313–314, 318; Hutchins et al. 2013, pp. 254–255; Bishop et al. 2014, pp. 90–91; Hutchins et al. 2016, pp. 1535–1539). Due to the historical absence of human-related contamination, we also infer that the toothless blindcat and widemouth blindcat are adapted to and require groundwater of a certain quality from the Edwards Aquifer that is relatively free of anthropogenic contaminants.

Longevity and reproduction of the toothless blindcat and widemouth blindcat is not known but can be inferred from other cavefish species. Cavefishes are generally characterized by life history traits such as increased age at first reproduction, lower numbers of reproductively active females, reduced numbers of eggs, slower growth rates, and longer life spans (Poulson 1963, pp. 266, 268, 275; Trajano 1997, p. 367; Trajano 2001, pp. 152–153; Trajano and Bichuette 2007, p. 114; Niemiller and Poulson 2010, pp. 220–227, 232–235; Secutti and Trajano 2021, p. 103). Estimated lifespans of other cavefish range from 8 to 45 years (Niemiller and Poulson 2010, p. 226; Trajano 1997, p. 367; Trajano 2001, pp. 151–152; Trajano and Bichuette 2007, p. 114; Secutti and Trajano 2021, p. 103).

Because the blindcats are cavefish, we assume that age at first reproduction for the toothless blindcat and widemouth blindcat is likely older than 2 years of age, and the age at reproductive maturity is likely 6 years of age or older; this is older than the age at first reproduction for surface catfish species and similar to or older than the age of reproductive maturity for the northern cavefish (Niemiller and Poulson 2010, p. 221). Also, like other cavefishes (Niemiller and Poulson 2010, pp. 221–222), we assume that only a fraction (3 percent to 13 percent) of female toothless blindcats and widemouth blindcats produce offspring on an annual basis. Clutch size is likely comparable to the small clutches produced by *Noturus* species (fewer than 200 eggs). Adult toothless blindcats and widemouth blindcats probably reach significant ages for catfishes, with maximum ages of multiple decades (more than 25 years). The toothless blindcat and widemouth blindcat inhabit a subterranean system that is well-buffered from immediate seasonal changes. However, seasonality of reproduction cannot be dismissed, as these fish may respond to periods of high or low groundwater flow in relation to aquifer recharge.

Regulatory and Analytical Framework

Regulatory Framework

Section 4 of the Act (16 U.S.C. 1533) and the implementing regulations in title 50 of the Code of Federal Regulations set forth the procedures for determining whether a species is an endangered species or a threatened species, issuing protective regulations for threatened species, and designating critical habitat for endangered and threatened species. In 2019, jointly with the National Marine Fisheries Service, the Service issued a final rule that revised the regulations in 50 CFR part 424 regarding how we add, remove, and reclassify endangered and threatened species and the criteria for designating listed species' critical habitat (84 FR 45020; August 27, 2019). On the same day, the Service also issued final regulations that, for species listed as threatened species after September 26, 2019, eliminated the Service's general protective regulations automatically applying to threatened species the prohibitions that section 9 of the Act applies to endangered species (84 FR 44753; August 27, 2019).

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 species' expected response and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species, such as any existing regulatory mechanisms or conservation efforts. The Secretary determines whether the species meets the definition of an ''endangered species'' or a ''threatened species'' only after conducting this cumulative analysis and describing the expected effect on the species 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 we 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 the 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 review of the best scientific and commercial data regarding the status of these species, including an assessment of the potential threats to the species. The SSA report does not represent our decision on whether the species should be proposed for listing as endangered or threatened species under the Act. However, it does provide the scientific basis that informs our regulatory decisions, which involve the further application of standards within the Act and its implementing regulations and policies.

To assess the viability of the toothless blindcat and the widemouth blindcat, we used the three conservation biology principles of resiliency, redundancy, and representation (Shaffer and Stein 2000, pp. 306–310). Briefly, resiliency is the ability of the species to withstand environmental and demographic stochasticity (for example, wet or dry, warm or cold years), redundancy is the ability of the species to withstand catastrophic events (for example, droughts, large pollution events), and representation is the ability of the species to adapt to both near-term and long-term changes in its physical and biological environment (for example, climate conditions, pathogens). In general, species viability will increase with increases in resiliency, redundancy, and representation (Smith et al. 2018, p. 306). Using these principles, we identified these 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 both individual species' life-history needs. The next stage involved an assessment of the historical and current condition of each species' demographics and habitat characteristics, including an explanation of how the species arrived at its current condition. The final stage of the SSA involved making predictions about the species' responses to positive and negative environmental and anthropogenic influences. Throughout all of these stages, we used the best available information to characterize viability as the ability of a species to sustain populations in the wild over time which we then used to inform our regulatory decision.

The following is a summary of the key results and conclusions from the SSA report; the full SSA report can be found at Docket No. FWS–R2–ES–2023–0069 on *https://www.regulations.gov.*

Summary of Biological Status and Threats

In this discussion, we review the biological condition of the toothless blindcat and the widemouth blindcat and their resources, and the threats that influence these species' current and future condition, in order to assess these species' overall viability and the risks to that viability.

Species Needs

Adequate Population Size

Both species of blindcats are assumed to have potentially numbered in the tens of thousands of individuals historically (Trajano 2001, pp. 145–146; Service 2022, pp. 43–44). Due to the toothless blindcat being in a lower trophic level as a detrivore and the widemouth blindcat being in a higher trophic level as a predator, we assume the population of the widemouth blindcat is smaller than that of the toothless blindcat (Trajano 2001, p. 145). Adequate population size at sufficient density is needed for both species to access mates for reproduction and withstand stochastic events. Mortality events in long-lived, reproductively constrained fish populations can have prolonged impacts on population demographics, including reduced numbers of sexually mature fish, reduced reproductive output, and diminished recruitment of younger individuals (Adams 1980, p. 7; Heppell et al. 2005, pp. 213–214, 217; Graening et al. 2010, pp. 74–75; Whiterod et al. 2018, pp. 622–626). Representation among various age-classes is needed to support recruitment of sexually mature adults to maintain adequate population sizes (Adams 1980, pp. 2–7; Poulson 2001, pp. 354–357; Hsieh et al. 2010, pp. 167–176).

Intact and Interconnected Subterranean Void Space

The toothless blindcat and widemouth blindcat inhabit subterranean voids of sufficient size and connectivity within the Edwards Aquifer. The species' occurrence from multiple wells along a southwest to northeast trending line in Bexar County suggests that the ranges of both species might be relatively continuous. Subterranean networks of water-filled conduits can facilitate gene flow through the water-filled voids of aquifers (Chippindale 2009, pp. 8–9; Vörös et al. 2018, p. 217; Corbin 2020, p. 75; Falniowski et al. 2021, pp. 4979–4980, 4985–4986; Grego and Pešić 2021, pp. 68, 73–74). Both fish species use these connected areas for dispersal, foraging, and reproduction (Service 2022, pp. 29–37, 44–45).

Adequate Groundwater Quantity

Sufficient volumes of groundwater are needed to fill subterranean void space and provide dispersal corridors for the species within a narrow band of the Edwards Aquifer. The region of the aquifer these species inhabit is an area of significant groundwater flow (Maclay and Small 1986, p. 66; Hovorka et al. 1996, pp. 50, 54–57; Worthington 2003, pp. 16, 20, 23–24, 31–32; Hovorka et al. 2004, pp. 19, 42; Lindgren et al. 2004, pp. 11, 15, 17–21, 26).

Suitable Water Quality

Over millions of years, both the toothless blindcat and widemouth blindcat have evolved to very deep aquifer conditions, including the water quality at these depths. Thus, they likely need water quality that matches natural aquifer conditions, including a pH of 7–8, a consistent temperature around 28 degrees Celsius (°C) (82 degrees Fahrenheit (°F)), specific conductivity between 465–482 microsiemens per centimeter (µS/cm), and relatively free of contaminants (Karnei 1978, pp. 115–116; Service 2022, pp. 37–41).

Chemolithoautotrophic Food Web

Subterranean systems at great depths and without direct connections to the surface are often isolated from surface sources of organic matter (Akob and Küsel 2011, p. 3534; Hubalek et al. 2016, pp. 2447–2448; Itävaara et al. 2016, pp. 4, 6–8). Instead, food webs in these settings may be based on microbial production of organic carbon from inorganic materials in a process termed chemolithoautotrophy (Engel 2007, pp. 187–188). Microbes involved in chemolithoautotrophy include a wide range of bacteria and fungi adapted to

the extreme conditions (such as high pressure and high salinity) of the deep subsurface (Amend and Teske 2005, pp. 145–147; Engel 2007, p. 188; Akob and Küsel 2011, pp. 3534, 3236; Itävaara et al. 2016, pp. 3–4, 20–22). The toothless blindcat is believed to be a detrivore that feeds on bacterial biofilms. The widemouth blindcat is hypothesized to be a predator that feeds on groundwater invertebrates and potentially suitably sized toothless blindcats. For both species to persist, they need a functional chemolithoautotrophic food web in an undegraded condition. Because groundwater in the Edwards Aquifer originates from precipitation and stream runoff, infusion of surface-borne nutrients to toothless blindcat and widemouth blindcat habitat cannot be discounted and may play some role in the deep aquifer food web. However, no accounts detailing surface-borne nutrient presence at great aquifer depth have been published to date.

Summary of Threats

We reviewed the potential threats that could be currently affecting the toothless blindcat and the widemouth blindcat. In this proposed rule, we will discuss only those threats in detail that could meaningfully impact the status of either species (a more in-depth analysis of all potential threats can be found in the SSA report (Service 2022, pp. 54–61, 87–95). We conducted a thorough analysis of threats to groundwater quality in terms of degradation due to pollutants and other contaminants and threats to groundwater quantity in the form of pumping and climate change. We found that while these threats may impact the species, they are not likely to have effects at the population or species level. For example, groundwater contamination has the potential to impact the toothless blindcat and widemouth blindcat (Service 2022, pp. 60–61). However, because of the depth of the species' habitat and the thick impermeable rock layer covering it, groundwater contamination is not a primary threat for the status of the toothless blindcat or the widemouth blindcat. Similarly, because of the depth of the species' habitat, groundwater quantity to support habitat for the fishes has not experienced change from historical conditions. Aquifer water levels where the blindcats reside show no evidence of long-term decline, even at times of prolonged drought and unregulated pumping (Maclay 1995, pp. 48, 52; Lindgren et al. 2004, 40–41, 45). In addition, management of groundwater withdrawals from the San Antonio segment has been in place since the late 1990s (National Research Council 2015, pp. 24–27, 29, 32–36; National Academies of Sciences, Engineering, and Medicine 2018, pp. 7–8, 109, 152; Hardberger 2019, pp. 193–194; Payne et al. 2019, p. 199) and pumped volumes have decreased since 2008 (Service 2022, pp. 80–81). Flow protection measures are in place that principally protect the two largest spring systems in the region (Comal Spring and San Marcos Spring systems), but those measures also benefit water levels deeper in the aquifer. We also note that, while competition with exotic species was identified in our 90-day finding (74 FR 66866; December 16, 2009) as a potential threat, a thorough review of the literature and consultation with experts revealed no evidence of exotic species competing with or otherwise impacting either species. The primary threat affecting the status of the toothless blindcat and the widemouth blindcat is mortality through groundwater well uptake (Factor E).

Groundwater Wells

Prior to well drilling and extraction of groundwater from the Edwards Aquifer in the late 19th century, the toothless blindcat and widemouth blindcat were unaffected by anthropogenic surface activities given the substantial depth of their habitat and the layers of impermeable rock that separated that habitat from the surface. Extraction of groundwater from wells represented a new and nearly constant stressor impacting both species' populations. Well mortality is currently the most direct and observable anthropogenic agent of mortality for both species. No toothless blindcat or widemouth blindcat expelled from groundwater wells has survived for any extended period, and many specimens are ejected mangled and dead due to battering as they are forced to the surface.

In Bexar County, the drilling of wells to meet public supply and irrigation demands began in the late 1880s (Livingston et al. 1936, p. 87; Petitt and George 1956, p. 44). The existence of the toothless blindcat and widemouth blindcat was only documented through individual fish expelled from groundwater wells in the early 20th century (Eigenmann 1919, pp. 397, 399–400; Hubbs and Bailey 1947, pp. 1, 4–11). More than 1,500 wells were drilled in Bexar County by 1953, with 250 wells being large capacity (*i.e.,* 25–76 centimeters (cm) (10–30 in) in diameter) (Petitt and George 1956, p. 44; Maclay 1995, p. 43), with additional large capacity wells drilled during the 1950s across the City of San Antonio and Bexar County (Petitt and George 1956, p. 47; Arnow 1959, pp. 24, 29). Until 1996, groundwater extraction in Bexar County was completely unregulated, with no restrictions on well capacity, volumes of water discharged, or groundwater waste (Miller 2005, pp. 172–173; Gulley 2015, p. 2; Mace 2019, p. 208). From 1939 to 2000, annual groundwater withdrawals increased by an average of 5,550,660 cubic meters (m^3) (4,500 acre-feet (ac-ft)) per year (Lindgren et al. 2004, pp. 35–36). As of September 28, 2022, the Texas Water Development Board (2022, unpaginated) lists 307 active wells, at depths of more than 300 m (984 ft), that access the artesian zone of the Edwards Aquifer in Bexar County.

The additive effect of anthropogenic mortality on cavefishes has been studied for only a few taxa. Cavefish exhibit delayed maturity, reduced fecundity, low mortality, and longer lifespans (Pianka 1970, p. 592; Bichuette and Trajano 2021, p. 2). Because cavefish have few offspring, the loss of individuals can have a substantial effect on the population; any fish that is killed does not survive to reproduce and contribute individuals to the population in the future. The Ozark cavefish (*Amblyopsis rosae*) is one example of the long-lasting impact of anthropogenic mortality. After the impact of human threats, populations of this species skewed towards older individuals with few younger fish present (Service 1989, p. 7; Graening et al. 2010, pp. 74–75). It was not until the 2000s, after a multi-decade period of recovery following the legal prohibition against collection, that a larger proportion of younger Ozark cavefish began to appear in populations, indicating the cessation of adult capture and the successful recruitment of juvenile fish (Graening et al. 2010, pp. 74–75).

Several deep-sea fishes also have similar life-history traits as cavefishes, including production of fewer and larger eggs, delayed sexual maturity, extended longevities, and roles as top predators in their respective systems (Poulson 2001, pp. 350, 357). Deep-sea fishes have been better studied regarding their response to anthropogenic mortality in the form of fishing (Adams 1980, pp. 1–2). Taxa such as orange roughy (*Hoplostethus atlanticus*), Patagonian toothfish (*Dissostichus eleginoides*), and other deep-sea species are very sensitive to overfishing (Adams 1980, pp. 4–5; Heppell et al. 2005, pp. 211–212). Fishing operations often target adult size classes that are slow to recruit into populations, which can lead to decreased egg production (Heppell et al. 2005, pp. 213–214, 217). As a result, deep-sea fish populations are slow to recover (*i.e.,* multiple decades) from

harvesting pressure due to reduced reproductive capacity (Adams 1980, p. 7; Whiterod et al. 2018, pp. 622–626).

The toothless blindcat and widemouth blindcat are among the oldest cavefishes in North America (Arce-H et al. 2017, pp. 421, 425). Both species, which are some of the deepest dwelling among known cavefishes, evolved over millions of years to inhabit very deep aquifer conditions (Trajano 2001, p. 140; Fišer et al. 2014, p. 976). The environmental stressors that typically affect and influence shallow subterranean systems (such as flooding, drying of cave passages/streams, and reduced surface nutrient input) are presumed to not operate, or are muted, at the depths where the blindcats occur. The deep artesian zone of the Edwards Aquifer provides a stable nutrient source (chemolithoautotrophy), consistent water quality (decades old groundwater), and very attenuated responses to climatic changes (temperature changes) on the surface. Given their long evolutionary history, the toothless blindcat and widemouth blindcat have life history traits that make them comparable to, if not more sensitive than, most other cavefishes in their response to increased loss of individuals from their populations.

While cavefish collection and deep-sea fishing removes larger size-class fish, loss of toothless blindcats and widemouth blindcats to groundwater pumping is plausibly size-indiscriminate. Wells extracting groundwater have the potential to remove blindcats at all life stages given that motile life stages move through water-saturated voids and are thus likely pelagic. Blindcats observed or collected from groundwater wells have been juveniles to adults. No eggs or smaller size classes (*e.g.,* larvae or fry) of either species have been reported to date. It is unlikely that eggs or larvae are not expelled from wells along with juveniles and adults. Rather, as larger individuals of both species are often severely mangled as they are forced up wells, it is probable that similarly transported eggs and larvae are physically destroyed and not visually discernable.

Additionally, unlike discrete collection and fishing events, groundwater pumping operates over much longer and sustained time frames given demands for groundwater. On an annual basis, wells may operate for several continuous months during the growing season for agricultural irrigation or nearly year-round for industrial and public water supply. The operational lifespan of many Bexar County wells is several decades long (*e.g.,* more than 60 years; Service 2022, pp. 70–80). Consequently, there has likely been very limited opportunity for cessation of this stressor where wells intercept toothless blindcat and widemouth blindcat habitat. In essence, groundwater wells may constitute near-permanent population sinks that can result in the mortality of most blindcats at all life stages. Loss of immature and adult individuals would constrain population growth through reductions in egg production and recruitment of mature adults. The impact of groundwater well mortality on toothless blindcat and widemouth blindcat populations could be substantial, with the potential to expel substantial numbers of toothless blindcats and widemouth blindcats over their operational lifespans (see *Current Condition,* below; Longley and Karnei 1978a, p. 36; Longley and Karnei 1978b, p. 39; Service 2022, pp. 74–79).

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

Conservation Efforts and Regulatory Mechanisms

In the early 1990s, federal litigation (*Sierra Club* v. *Secretary of the Interior,* No. MO–91–CA–069, U.S. District Court for the Western District of Texas) directed the Service to make determinations regarding minimum spring flows and aquifer levels necessary to support listed species occurring in the Comal Spring and San Marcos Spring systems. The Service produced a recovery plan with that guidance in 1996 (Service 1996, entire). Another outcome of litigation was the creation, in 1993, of the Edwards Aquifer Authority by the State of Texas to manage groundwater withdrawals (by nonexempt wells) from the San Antonio segment of the Edwards Aquifer (National Research Council 2015, pp. 24–26; Hardberger 2019, pp. 193–194; Payne et al. 2019, p. 199). The regulatory area of the Edwards Aquifer Authority includes all or a portion of Bexar, Comal, Hays, Medina, and Uvalde Counties.

The Edwards Aquifer Authority developed a habitat conservation plan, approved by the Service in 2013, which provides measures to minimize and mitigate take of the nine listed species related to covered activities (National Research Council 2015, pp. 27, 29, 32–36; RECON Environmental, Inc. 2021, pp. 3–55–3–67). Covered activities include groundwater withdrawals for drinking water supplies and irrigation as well as recreational activities (National Research Council 2015, pp. 32–36; RECON Environmental, Inc. 2021, pp. 2–1–2–16).

The voluntary minimization and mitigation measures of the plan are based on maintaining sufficient minimum flows at Comal Spring and San Marcos Spring to sustain listed species during a reoccurrence of prolonged drought conditions (National Research Council 2015, pp. 32–36; National Academies of Sciences, Engineering, and Medicine 2018, pp. 67–68; Service 2022, p. 64). A review of the Edwards Aquifer Habitat Conservation Plan suggests that flow protection measures, including groundwater modeling efforts, appear to be effective in meeting flow requirements of covered species (National Academies of Sciences, Engineering, and Medicine 2018, pp. 7–8, 109, 152). Additionally, volumes of groundwater pumped from the San Antonio segment of the Edwards Aquifer have decreased since 2008 (Service 2022, pp. 64–65).

The toothless blindcat and widemouth blindcat are not included in the habitat conservation plan because the plan's actions are most applicable to spring-dwelling species that inhabit upper portions of the Edwards Aquifer (RECON Environmental, Inc., pp. 1–9). However, protection of sustained flow at the Comal Spring and San Marcos Spring systems does provide overarching protection for species that inhabit deep portions of the San Antonio segment. Persistence of surface discharge at those spring systems suggests that deeper levels of the aquifer have not been appreciably reduced and remain water-saturated (Maclay 1995, pp. 48, 52; Lindgren et al. 2004, 40–41, 45).

An additional conservation measure is land protection efforts by the City of San Antonio's Edwards Aquifer Protection Program (Stone and Schindel 2002, pp. 38–39; Carnett 2022, unpaginated). In 2000, San Antonio passed Proposition 3, an initiative to fund the acquisition (fee-simple and conservation easements) of open space

to protect the contributing and recharge zones of the aquifer in Bexar County (Romero 2018, p. 2). That program was reapproved in 2005, 2010, and 2015, with additional funds to acquire open space (Reilly and Carter 2018, pp. 1–3–1–5). The effort was later expanded to acquire lands in Medina and Uvalde Counties that contain larger portions of the Edwards Aquifer's contributing and recharge zones (Romero 2018, pp. 5–6, 8). The dedicated sales tax expired in 2021, with 97,124 hectares (240,000 acres) acquired under the Edwards Aquifer Protection Program (Carnett 2022, unpaginated). The City of San Antonio recently approved an alternative funding stream to support land acquisitions through the commitment of $100 million over 10 years (Carnett 2022, unpaginated). Protection of open space has the potential to reduce the impacts of development (for example, run-off from impervious cover, fertilizer applications, and wastewater) and maintain aquifer recharge (Reilly and Carter 2018, pp. 3–2, 3–6; Romero 2018, pp. 5–6).

Several other entities also have measures to protect groundwater from contamination. These entities include the Edwards Aquifer Authority's Aboveground Storage Tank Program, Agricultural Secondary Containment Assistance Program, and Abandoned Well Program, among others (Edwards Aquifer Authority 2022, unpaginated). The San Antonio Water System implemented several water quality protection measures including development regulations (City of San Antonio Code of Ordinances, chapter 34, article VI, division 6, Aquifer Protection Ordinance No. 81491) for properties over the contributing and recharge zones, review of building permits and master development plans, regulation of underground storage tanks, and commercial/industrial compliance (San Antonio Water System 2022, unpaginated).

Current Condition

To assess the current conditions of the toothless blindcat and widemouth blindcat, we established analysis units immediately around well sites with documented records of the toothless blindcat or widemouth blindcat (''immediate area analysis units''), as well as a larger area encompassing these smaller units (''potential area of occurrence'') in order to assess threats to the fishes in a more spatially extensive area with a potentially contiguous subterranean system of voids within the aquifer. Neither of these units define populations but rather geographic areas we presume are areas of potential occupancy or areas that are important to or could influence both species' survival. The SSA report further details the methodology and rationale for creating these units (Service 2022, pp. 67–68).

Eight wells that historically produced toothless blindcat (six wells) and widemouth blindcat (four wells; two of which overlap with the toothless blindcat wells) have either been capped, plugged, or destroyed. Three wells that produced toothless blindcats (one of which also produced widemouth blindcats) are presumed to still operate, as we do not have access to the wells to confirm, nor do we have evidence to the contrary. Including these three wells, the immediate area analysis units contain a combined total of 27 active groundwater wells. Most of these wells are for agricultural irrigation or public water supply. The average age of these wells is 68 years, with the oldest well drilled in 1933 and the latest in 1985. Seventeen wells in the analysis units have been abandoned, plugged, or destroyed, including historical blindcat wells. Besides the documented blindcat wells in the analysis units, only 1 of the 24 active wells has ever been sampled for blindcats due to lack of access.

In the larger potential area of occurrence, a total of 82 active groundwater wells are established, including the active blindcat wells. Most of these wells are used for irrigation, public water supply, and industrial purposes. Primary water uses of the remaining wells are for aquaculture, domestic purposes, and livestock. Average age of active wells is 66 years, with the earliest wells drilled in 1915 and most recent in 2020. There are 36 abandoned, plugged, or destroyed wells in the potential area of occurrence. The four wells that have been sampled in this area showed no evidence of either blindcat species (Karnei 1978, pp. 68–70; Zara Environmental 2010, p. 68; 2020, p. 10).

Well Mortality Estimates

Researchers who have sampled groundwater wells for the toothless blindcat and widemouth blindcat have developed catch-per-unit-effort estimates for their sampling efforts (Longley and Karnei 1978a, pp. 35–36; 1978b, pp. 36, 38–40; Zara Environmental 2020, pp. 23–27). Catch per unit effort was expressed as volume of groundwater exiting a well to produce one individual of either species. Available estimates were based on surveys of toothless blindcat and widemouth blindcat populations that had already been subjected to several decades of unregulated groundwater extraction. The status of both blindcat species' populations prior to groundwater pumping is unknown, although it is known that both species experienced mortality once wells were established. It is plausible that, at the time of survey efforts (late 1970s and 2008 to 2014), toothless blindcat and widemouth blindcat population resiliency had already been diminished to some extent from past well mortality.

We assume that a higher catch per unit effort at a well, or lower volume of groundwater required to produce a single individual, may reflect larger blindcat populations. The highest catch per unit effort for both the toothless blindcat and widemouth blindcat comes from estimates for the Artesia Pump Station Well, with one toothless blindcat caught with every 65,000 m^3 (53 ac-ft) of groundwater and one widemouth blindcat caught with every 129,515 m^3 (105 ac-ft) of groundwater (see Table 1 below; Longley and Karnei 1978a, pp. 35–36; 1978b, pp. 36, 38–40).

We apply those estimates of catch per unit effort to estimate blindcat well mortality. These estimates of blindcat well mortality do not account for variability in distribution and extent of suitable blindcat habitat, fish abundances by site, well size and discharge capacity, periods of discharge (intermittent or constant), location of well casing relative to potential habitat, and reporting of discharged volumes. Complete data on those and other variables are not available.

Estimates of well mortality also only apply to assumed losses of larger juvenile and adult fishes. Catch per unit effort has never been developed for larvae and very small juveniles. The following estimates of well mortality will therefore be underestimates, as no data exist on loss of those life stages. Research on other cavefishes and deep-sea fishes with similar life history traits suggests that sustained loss of individuals, especially sexually mature fish, can result in reduced population sizes and changes in demographic structure.

To estimate average annual mortality, we examined pumped groundwater volume data available for 51 wells in the potential area of occurrence between the years of 2010 to 2017 (Edwards Aquifer Authority 2021, unpaginated). Using the annual average volume of groundwater pumped from all 51 wells, 10,401,411 m^3 (8,433 ac-ft), multiplied by the estimated catch per unit effort, 159 toothless blindcats and 80 widemouth blindcats may have been expelled from wells annually. This is likely an underestimate of losses, as it does not

include losses of other immature stages, such as larvae or fry. These numbers could be higher still considering the remaining active wells for which pumped data are not available. Abandoned and plugged wells would have also contributed to past mortality during their operational lifespans.

Most wells in the potential area of occurrence have been in operation for multiple decades (average age of 66 years). To illustrate the potential total loss of blindcats to wells operated over several decades, we assigned the average annual volume discharged (calculated from three wells from 2010 to 2017) to all wells for all years between the completion of a well to 2021 (the latest year for which data were available). As we assume the blindcats have long lifespans, the likelihood that individuals will encounter the capture zone of an active groundwater well increases over time. Wells operating over several decades, and discharging relatively moderate volumes of groundwater, could result in the loss of over a thousand toothless blindcats and several hundred widemouth blindcats per individual well (see Table 1 below, Service 2022, p. 77).

TABLE 1—ESTIMATED POTENTIAL LOSS OF TOOTHLESS BLINDCATS AND WIDEMOUTH BLINDCATS TO GROUNDWATER WELLS

Species	Volume to produce one individual	Individuals lost per year per well	Total estimated number of individuals lost in 51 wells within potential area of occurrence
Toothless blindcat	65,000 m^3 (53 ac-ft)	159	535,194
Widemouth blindcat	129,515 m^3 (105 ac-ft)	80	269,280

Estimates are for the wells within the potential area of occurrence with water volume data (n = 51), given operational lifespan (average age of 66 years), and catch per unit effort reported for Artesia Pump Station Well (Longley and Karnei 1978a, pp. 35–36; 1978b, pp. 36, 38–40).

In addition to the estimated loss from moderate capacity wells, greater capacity wells have been drilled in or near the potential area of occurrence, but data are lacking regarding their historical discharge volumes. The following mortality estimates for larger capacity wells further illustrate the potential impact high volume wells could have on blindcat numbers over decades of operation.

In 1941, San Antonio Public Service Company Well 4 was drilled to a depth of 314 m (1,032 ft) (Livingston 1942, p. 1; Petitt and George 1956, p. 47). That well is approximately 2.4 km (1.5 mi) to the northeast of Bexar Metropolitan Water District Well (a widemouth blindcat locality) and 7.5 km (4.7 mi) to the southwest of the Artesia Pump Station Well (a toothless blindcat and widemouth blindcat locality). It is conceivable that blindcat habitat extended to that location, although the well has never been sampled for either fish species.

Flow at San Antonio Public Service Company Well 4 has been recorded at 1.05 m^3 per second (m^3/sec) (37 cubic feet per second (ft^3/sec)) (Livingston 1942, pp. 3–4). Flow at that rate over 12 months would result in discharge of 33,134,800 m^3 (26,863 ac-ft) of groundwater and potentially 507 toothless and/or 266 widemouth blindcats per year. If that well operated at that capacity over its 81-year operational lifespan, 41,055 toothless blindcats and 20,723 widemouth blindcats could have potentially been expelled from the well. Well 4 is still in operation based on Texas Water Development Board records.

In 1891, the first of a series of 20 to 30 cm (8 to 12 in) diameter wells were drilled in what would become the Market Street Pump Station (Ewing 2000, pp. 13, 15, 22; Eckhardt 2016, unpaginated). The 1891 well was 271 m (890 ft) deep and produced 4,144,499 m^3 (3,360 ac-ft) of groundwater per year (Ewing 2000, pp. 13, 22). Three additional wells were drilled in 1894, one well with an annual pumped capacity of 7,598,248 m^3 (6,160 ac-ft) and two wells at 4,144,499 m^3 (3,360 ac-ft) (Ewing 2000, p. 22). The total annual pumping capacity of these four wells would have been 20,031,745 m^3 (16,240 ac-ft). If blindcats entered the capture zones of these wells, 305 toothless blindcats and 155 widemouth blindcats could have been discharged per year.

By 1924, the Market Street pump station had 12 wells with a combined capacity of pumping 59,404,485 m^3 (48,160 ac-ft) per year (Ewing 2000, p. 15). The pump station's 1924 capacity of 59,404,485 m^3 (48,160 ac-ft) could have resulted in the discharge of 9,086 toothless blindcats and 4,587 widemouth blindcats over a 10-year period. At that same rate, from 1924 to 2022, 89,051 toothless blindcats and 44,491 widemouth blindcats would have been expelled from wells over that 98-year period. The Market Street pump station is still in operation today with several large capacity wells (Eckhardt 2016, unpaginated).

While these scenarios of blindcat losses due to wells are hypothetical estimates, they provide insight into the scale of well mortality for the toothless blindcat and widemouth blindcat. We know that both species are ejected by groundwater wells and die. It is evident that wells extracting water from the artesian zone remove blindcats and that large capacity wells have the potential to expel thousands of individuals over a well's operational lifespan. However, the location and depth of wells influence their ability to affect blindcat populations; only certain wells will intercept areas occupied by toothless and/or widemouth blindcats. That said, very productive groundwater wells likely intercept larger water-filled voids that would serve as blindcat habitat (Maclay 1995, p. 43).

Conclusions

The most significant stressor to populations of the toothless and widemouth blindcats is mortality due to groundwater pumping. Individuals of both species are forced up artesian and pumped wells where they are physically damaged and killed. Wells with long operational lifespans could have resulted in the deaths of thousands to tens of thousands of individuals. All life stages of the blindcats are expected to experience mortality due to the action of groundwater wells. The greatest loss of

blindcats potentially occurred from the early 1940s into the early 1960s, when the largest number of groundwater wells were drilled in the potential area of occurrence within the Edwards Aquifer.

The widemouth blindcat has not been observed from any well since 1984. Due to groundwater pumping, the species may have declined to undetectable numbers (Ferretti et al. 2008, pp. 960–962) or become functionally extinct (*i.e.,* permanent reproductive failure prior to true extinction; Ricciardi et al. 1998, p. 617; Delord 2007, p. 659; Bull et al. 2009, p. 419; Roberts et al. 2017, p. 1193). Toothless blindcats, however, have been taken from the Aldridge 209 Well most years between 2008 and 2013 and from 2020 to 2022. The species appears to be persisting in this area but seemingly in low numbers. Between 2008 and 2013, material potentially representing 13 individual toothless blindcats was taken from the Aldridge 209 Well (Zara Environmental 2020, pp. 11, 18–20). Between 2021 and 2022, material potentially comprising four toothless blindcats was taken from the same well (Diaz 2021, p. 29). Whether abundance of the species at that site has declined over the well's 67-year operational lifespan is unknown. We assume that numbers of the toothless blindcats at the Aldridge 209 Well are likely lower than prior to 1955, when the well was first drilled. The next most recent records for the toothless blindcat are at Tschirhart Well in 2010. The status of both species at other wells is unknown, as they remain unsampled since the late 1970s to 1980s due to lack of sampling access.

While pumping has resulted in the directly mortality of both species, groundwater quantity to support habitat for the fishes has not experienced change from historical conditions. In contrast to surface aquifer levels, which occasionally decline, the exceedingly deep aquifer water levels where the fishes reside show no evidence of long-term decline, even at times of prolonged drought and unregulated pumping (Maclay 1995, pp. 48, 52; Lindgren et al. 2004, 40–41, 45). In addition, management of groundwater withdrawals from the San Antonio segment has been in place since the late 1990s (Service 2022, pp. 62–66) and pumped volumes have decreased since 2008 (Service 2022, pp. 64–65). Flow protection measures are in place that principally protect the Comal Spring and San Marcos Spring systems, but those measures also benefit water levels deeper in the aquifer. Groundwater contamination does not appear to have been a widespread or prevalent stressor for either species. In terms of drinking water standards, contaminants in the San Antonio segment occur in relatively low concentrations. The presence of contaminants also decreases with depth in the aquifer where older water is less affected by contamination. Complete analyses of the impact of the threats of groundwater quantity, climate change, and contamination on the toothless blindcat and the widemouth blindcat can be found in the SSA report (Service 2022, pp. 81–85).

Based on available information, we expect that the resiliency of both species' populations has been reduced from pre-1950 levels, the period of new groundwater well establishment in the analysis unit. Although populations of the toothless blindcat and widemouth blindcat have been postulated as large (Longley and Karnei 1978a, p. 36; 1978b, p. 39; Trajano 2001, pp. 145–146), the extensive estimated mortality from groundwater wells has likely taken a toll on those potential numbers. Additionally, because the toothless blindcat and the widemouth blindcat exist as single sympatric subterranean populations, both species effectively lack redundancy and have limited representation. This places the toothless and widemouth blindcats at greater risk from stochastic events and anthropogenic stressors, such as groundwater well mortality. Well mortality has likely reduced the abundance of both blindcats. Furthermore, the life history traits of both species suggest that sustained loss of individuals, especially sexually mature fish, can result in reduced population sizes and changes in demographic structure in the form of lower numbers of sexually mature fish, reduced reproductive output, and diminished recruitment of younger individuals.

Future Condition

As part of the SSA, we evaluated the future conditions of the toothless blindcat and widemouth blindcat by examining the most plausible future projections for human population growth, groundwater demands, and climate change. Our projections show ongoing well mortality through groundwater pumping, but no significant change to toothless blindcat and widemouth blindcat habitat due to groundwater quality and quantity (Service 2022, pp. 81–86). Because we determined that the current conditions of both species are consistent with an endangered species (see Determination of the Toothless Blindcat's and Widemouth Blindcat's Status, below), we are not presenting the results of the future scenarios in this proposed rule. Please refer to the SSA report (Service 2022, pp. 86–95) for the full analysis of future scenarios.

Determination of the Toothless Blindcat's and Widemouth Blindcat's Status

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

Status Throughout All of Their Ranges

We find that mortality resulting from the pumping of groundwater wells (Factor E) is the primary threat to both species. The species occupy a limited range, and populations of both species have likely been severely reduced since the introduction of groundwater wells in the late 19th to early 20th century. There are currently 82 active groundwater wells in the potential area of occurrence (Service 2022, p. 72). No toothless blindcat or widemouth blindcat expelled from groundwater wells has survived for any extended period, and many specimens are ejected mangled and dead due to battering as they are forced to the surface. Discharge and sampling data indicate an individual well operating over several decades (that is, since the 1950s), and discharging relatively moderate volumes of groundwater could conservatively result in losses of over a thousand toothless blindcats and several hundred widemouth blindcats.

These losses of individual fish to groundwater wells over time suggest that both species were, and will continue to be, impacted from actively pumped wells. Although population sizes for the toothless blindcat and widemouth blindcat may have historically been large, we project that

thousands to tens of thousands of fish have been lost to groundwater wells since the early 1900s, and that the resiliency of both species' populations has been reduced. Both the toothless blindcat and the widemouth blindcat are long-lived and pelagic, and thus more likely to encounter a well over their lifespan and be captured by well uptake. These species have life-history traits that limit reproductive capacity and recruitment, as documented in other cavefish species. These same traits make the blindcats more susceptible to long-lasting population impacts from well mortality losses.

The widemouth blindcat has not been observed at a well since the mid-1980s, and toothless blindcat has only been expelled from a single groundwater well multiple times between 2008 and 2013 and from 2020 to 2022. The toothless blindcat thus appears to be persisting at this location in low numbers. Well mortality has likely reduced the abundances of both blindcats along with effects on demographic structure in the form of lower numbers of sexually mature fish, reduced reproductive output, and diminished recruitment of younger individuals. Given these impacts and the limited range of both species, it is unlikely that even relatively robust populations of the toothless blindcat and widemouth blindcat could indefinitely sustain continued losses from well mortality. Both species have limited redundancy and representation, making the loss of resiliency from well mortality particularly detrimental.

After evaluating threats to the species and assessing the cumulative effect of the threats under the Act's section 4(a)(1) factors, we conclude that both species have experienced and continue to experience the deleterious impacts of well mortality to such an extent that both species are currently in danger of extinction, rather than at some point in the foreseeable future. Therefore, both species meet the Act's definition of an endangered species rather than that of a threatened species. Thus, after assessing the best available information, we determine that both the toothless blindcat and the widemouth blindcat are in danger of extinction throughout all of their ranges.

Status Throughout a Significant Portion of Their Ranges

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. We have determined that the toothless blindcat and widemouth blindcat are in danger of extinction throughout all of their ranges and accordingly did not undertake an analysis of any significant portion of their ranges. Because the toothless blindcat and widemouth blindcat warrant listing as endangered throughout all of their ranges, our determination does not conflict with the decision in *Center for Biological Diversity* v. *Everson,* 435 F. Supp. 3d 69 (D.D.C. 2020), which vacated the provision 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) providing that if the Service determines that a species is threatened throughout all of its range, the Service will not analyze whether the species is endangered in a significant portion of its range.

Determination of Status

Our review of the best available scientific and commercial information indicates that both the toothless blindcat and widemouth blindcat meet the Act's definition of an endangered species. Therefore, we propose to list both the toothless blindcat and the widemouth blindcat as endangered species in accordance with sections 3(6) 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 as a listed species, planning and implementation of 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, including the Service, 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 goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

The recovery planning process begins with development of a recovery outline made available to the public soon after a final listing determination. The recovery outline guides the immediate implementation of urgent recovery actions while a recovery plan is being developed. Recovery teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) may be established to develop and implement recovery plans. The recovery planning process involves the identification of actions that are necessary to halt and reverse the species' decline by addressing the threats to its survival and recovery. The recovery plan 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. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. The recovery outline, draft recovery plan, final recovery plan, and any revisions will be available on our website as they are completed (*https://www.fws.gov/program/endangered-species*), or from our Austin Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribes, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (*e.g.,* restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their ranges may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private, State, and Tribal lands.

If these species are listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost-share grants for non-Federal landowners, the

academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the State of Texas would be eligible for Federal funds to implement management actions that promote the protection or recovery of the toothless blindcat and widemouth blindcat. Information on our grant programs that are available to aid species recovery can be found at: *https://www.fws.gov/service/financial-assistance.*

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

Section 7 of the Act is titled Interagency Cooperation and mandates all Federal action agencies to use their existing authorities to further the conservation purposes of the Act and to ensure that their actions are not likely to jeopardize the continued existence of listed species or adversely modify critical habitat. Regulations implementing section 7 are codified at 50 CFR part 402.

Section 7(a)(2) states that each Federal action agency shall, in consultation with the Secretary, ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. Each Federal agency shall review its action at the earliest possible time to determine whether it may affect listed species or critical habitat. If a determination is made that the action may affect listed species or critical habitat, formal consultation is required (see 50 CFR 402.14(a)), unless the Service concurs in writing that the action is not likely to adversely affect listed species or critical habitat. At the end of a formal consultation, the Service issues a biological opinion, containing its determination of whether the Federal action is likely to result in jeopardy or adverse modification.

In contrast, section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action which *is likely* to jeopardize the continued existence of any species proposed to be listed under the Act or result in the destruction or adverse modification of critical habitat proposed to be designated for such species. Although the conference procedures are required only when an action is likely to result in jeopardy or adverse modification, action agencies may voluntarily confer with the Service on actions that may affect species proposed for listing or critical habitat proposed to be designated. In the event that the subject species is listed or the relevant critical habitat is designated, a conference opinion may be adopted as a biological opinion and serve as compliance with section 7(a)(2) of the Act.

Examples of discretionary actions for the toothless blindcat and the widemouth blindcat that may be subject to conference and consultation procedures under section 7 are land management or other landscape-altering activities on Federal lands administered by the U.S. Department of Agriculture as well as actions on State, Tribal, local, or private lands that require a Federal permit (such as a permit from the U.S. Army Corps of Engineers under section 404 of the Clean Water Act (33 U.S.C. 1251 *et seq.*) or a permit from the Service under section 10 of the Act) or that involve some other Federal action (such as funding from the Federal Highway Administration, Federal Aviation Administration, or the Federal Emergency Management Agency). Federal actions not affecting listed species or critical habitat—and actions on State, Tribal, local, or private lands that are not federally funded, authorized, or carried out by a Federal agency—do not require section 7 consultation. Federal agencies should coordinate with the local Service field office (see **FOR FURTHER INFORMATION CONTACT**, above) with any specific questions on section 7 consultation and conference requirements.

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 commit, to attempt to commit, to solicit another to commit, or to cause to be committed any of the following: (1) Import endangered wildlife into, or export from, the United States; (2) take (which includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct) endangered wildlife within the United States or on the high seas; (3) possess, sell, deliver, carry, transport, or ship, by any means whatsoever, any such wildlife that has been taken illegally; (4) deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of commercial activity; or (5) sell or offer for sale in interstate or foreign commerce. Certain exceptions to these prohibitions apply to employees or agents 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 for endangered wildlife are codified at 50 CFR 17.22. With regard to endangered wildlife, a permit may be issued for scientific purposes, for enhancing the propagation or survival of the species, or for take incidental to otherwise lawful activities. The statute also contains certain exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

It is the policy of the Services, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), to identify, to the extent known at the time a species is listed, specific activities that will not be considered likely to result in violation of section 9 of the Act. To the extent possible, activities that will be considered likely to result in violation will also be identified in as specific a manner as possible. 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 or would not be likely to result in a violation of section 9 of the Act beyond what is already clear from the descriptions of prohibitions or already excepted through our regulations at 50 CFR 17.21 (*e.g.,* any person may take endangered wildlife in defense of his own life or the lives of others). As discussed above, certain activities that are prohibited under section 9 may be permitted under section 10 of the Act. Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Austin Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

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

Critical habitat receives protection under section 7 of the Act through the requirement that each Federal action agency 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 designated 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 also 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. Rather, designation requires that, where a landowner requests Federal agency funding or authorization for an action that may affect an area designated as critical habitat, the Federal agency consult with the Service under section 7(a)(2) of the Act. If the action may affect the listed species itself (such as for occupied critical habitat), the Federal agency would have already been required to consult with the Service even absent the designation because of the requirement to ensure that the action is not likely to jeopardize the continued existence of the species. Even if the Service were to conclude after consultation that the proposed activity is likely to 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 data available, those physical or biological features that are essential to the conservation of the species (such as space, food, cover, and protected habitat).

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.

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 the 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, or other species conservation planning efforts if new information available at the time of those 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.

As discussed above, there are no significant habitat-based threats that currently, or would in the future, limit habitat for the toothless blindcat and the widemouth blindcat. The present or threatened destruction, modification, or curtailment of the blindcats' habitat or range is not a threat to the species. In light of the particular circumstances of these two species, we have determined that designation of critical habitat is not prudent. We reach this conclusion largely because of the nature of the main threat for these species: direct mortality resulting from groundwater well pumping (Factor E). The wells constructed in these blindcats' habitat are not affecting the species through habitat destruction or modification; instead, it is the capture, entrainment, and death of individuals due to the pumping of groundwater wells that is a threat to the species. Designation of critical habitat would not provide any additional protective measures or benefits that address this specific threat. In addition, the designation of critical habitat would not provide otherwise unavailable information to guide conservation efforts for these species. Therefore, a designation of critical habitat would not be advantageous for these species.

Since we have determined that the present or threatened destruction, modification, or curtailment of both species' habitat or range is not a threat to the toothless blindcat and the widemouth blindcat, in accordance with 50 CFR 424.12(a)(1), we determine that designation of critical habitat is not prudent for the toothless blindcat and the widemouth blindcat.

Required Determinations

Clarity of the Rule

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

(1) Be logically organized;

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

(3) Use clear language rather than jargon;

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

(5) Use lists and tables wherever possible.

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

Government-to-Government Relationship With Tribes

In accordance with the President's memorandum of April 29, 1994 (Government-to-Government Relations with Native American Tribal Governments; 59 FR 22951), E.O. 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 federally recognized Tribes on a government-to-government basis. In accordance with Secretary's Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with Tribes in developing programs for healthy ecosystems, to acknowledge that Tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to Tribes. No Tribal lands were identified within the range of the toothless blindcat or widemouth blindcat.

References Cited

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

Authors

The primary authors of this proposed rule are the staff members of the Fish and Wildlife Service's Species Assessment Team and the Austin Ecological Services Field Office.

List of Subjects in 50 CFR Part 17

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

Proposed Regulation Promulgation

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

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

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

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

■ 2. In § 17.11, in paragraph (h), amend the List of Endangered and Threatened Wildlife by adding entries for ''Blindcat, toothless'' and ''Blindcat, widemouth'' in alphabetical order under FISHES to read as follows:

§ 17.11 Endangered and threatened wildlife.

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(h) * * *

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
*	*	*	*	* * *
FISHES				

Appendix D2 | **USFWS's Delisting of the San Marcos Gambusia**

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[FF08E22000 FXES111309FEDR 234]

RIN 1018–BC98

Endangered and Threatened Wildlife and Plants; Removal of 21 Species From the List of Endangered and Threatened Wildlife

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service or USFWS), are removing 21 species from the Federal List of Endangered and Threatened Wildlife due to extinction. This action is based on a review of the best available scientific and commercial information, which indicates that these species are no longer extant and, as such, no longer meet the definition of an endangered species or a threatened species under the Endangered Species Act of 1973, as amended (Act).

DATES: This rule is effective November 16, 2023.

ADDRESSES: The proposed rule and this final rule, the comments we received on the proposed rule, and supporting documents are available at *https://www.regulations.gov* under the following docket numbers:

Species	Docket No.
Kauai akialoa	FWS–R1–ES–2020–0104
Kauai nukupuu	FWS–R1–ES–2020–0104
Kauai ʻoʻo (honeyeater)	FWS–R1–ES–2020–0104
Large Kauai thrush (kamʻa)	FWS–R1–ES–2020–0104
Maui akepa	FWS–R1–ES–2020–0104
Maui nukupuu	FWS–R1–ES–2020–0104
Molokai creeper (kakawahie)	FWS–R1–ES–2020–0104
Poʻouli (honeycreeper)	FWS–R1–ES–2020–0104
Bridled white-eye	FWS–R1–ES–2020–0104
Little Mariana fruit bat	FWS–R1–ES–2020–0104
San Marcos gambusia	FWS–R2–ES–2020–0105
Scioto madtom	FWS–R3–ES–2020–0106
Flat pigtoe	FWS–R4–ES–2020–0107
Southern acornshell	FWS–R4–ES–2020–0107
Stirrupshell	FWS–R4–ES–2020–0107
Upland combshell	FWS–R4–ES–2020–0107
Green blossom (pearly mussel)	FWS–R4–ES–2020–0108
Tubercled blossom (pearly mussel)	FWS–R4–ES–2020–0108
Turgid blossom (pearly mussel)	FWS–R4–ES–2020–0108
Yellow blossom (pearly mussel)	FWS–R4–ES–2020–0108
Bachman's warbler	FWS–R4–ES–2020–0110

FOR FURTHER INFORMATION CONTACT:

Species	Contact information
Bridled white-eye, Kauai akialoa, Kauai nukupuu, Kauai ʻoʻo (honeyeater), large Kauai thrush (kama), little Mariana fruit bat, Maui akepa, Maui nukupuu, Molokai creeper (kakawahie), and poʻouli (honeycreeper).	Earl Campbell, Field Supervisor, Pacific Islands Fish and Wildlife Office, 300 Ala Moana Boulevard, Suite 3–122, Honolulu HI 96850, Telephone: 808–792–9400.
Bachman's warbler	Thomas McCoy, Field Supervisor, South Carolina Field Office, 176 Croghan Spur, Charleston, SC 29407, Telephone: 843–300–0431.
Flat pigtoe, southern acornshell, stirrupshell, and upland combshell	James Austin, Deputy Field Supervisor, Mississippi Field Office, 6578 Dogwood View Parkway, Suite A, Jackson, MS 39213, Telephone: 601–321–1129.
Green blossom (pearly mussel), tubercled blossom (pearly mussel), turgid blossom (pearly mussel), and yellow blossom (pearly mussel).	Daniel Elbert, Field Supervisor, Tennessee Field Office, Interior Region 2—South Atlantic-Gulf (Tennessee), 446 Neal Street, Cookeville, TN 38506, Telephone: 931–528–6481.
San Marcos gambusia	Karen Myers, Field Supervisor, Austin Ecological Services Field Office, 1505 Ferguson Lane, Austin, TX 78754, Telephone: 512–490–0057.
Scioto madtom	Patrice Ashfield, Field Supervisor, Ohio Ecological Services Field Office, 4625 Morse Road, Suite 104, Columbus, OH 43230, Telephone: 614–416–8993.

Individuals in the United States who are deaf, deafblind, hard of hearing, or have a speech disability may dial 711 (TTY, TDD, or TeleBraille) to access telecommunications relay services. Individuals outside the United States should use the relay services offered within their country to make international calls to the point-of-contact in the United States.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations in title 50 of the Code of Federal Regulations (50 CFR part 424) set forth the procedures for adding species to,

removing species from, or reclassifying species on the Federal Lists of Endangered and Threatened Wildlife and Plants in 50 CFR part 17. Under our regulations at 50 CFR 424.11(e)(1), a species shall be delisted if, after conducting a status review based on the best scientific and commercial data available, we determine that the species is extinct. The 21 species in this final rule are currently listed as endangered or threatened; we are delisting them due to extinction. We can only delist a species by issuing a rule to do so.

What this document does. We are removing 21 species from the List of Endangered and Threatened Wildlife (List) due to extinction.

While our September 30, 2021, proposed rule (86 FR 54298) proposed to delist 23 species, this rule makes final the delisting of only 21 of those. Elsewhere in this issue of the **Federal Register**, we withdraw our proposed delisting of *Phyllostegia glabra* var. *lanaiensis,* which was part of our September 30, 2021, proposed rule.

The basis for our action. We have determined that the 21 species that are the subjects of this rule should be removed from the List because the best available information indicates that they are extinct.

Peer review. In accordance with our policy, ''Notice of Interagency Cooperative Policy for Peer Review in Endangered Species Act Activities,'' which was published on July 1, 1994 (59 FR 34270) and our August 22, 2016, Director's Memorandum ''Peer Review Process,'' we sought the expert opinion of 28 appropriate and independent specialists for 13 species in this rule. We requested those experts review the scientific data and interpretations for each species or group of species for which the associated 5-year review had not been peer reviewed prior to publication of the proposed rule (86 FR 54298; September 30, 2021). For the eight southeastern mussel species, the 5-year reviews were peer reviewed prior to the publication of the proposed rule. In certain cases, species were grouped together for peer review based on similarities in biology or geographic occurrences. We sent copies of the 5-year species status reviews to the peer reviewers immediately following the proposed rule's publication in the **Federal Register**. The purpose of such review is to ensure that our decisions are based on scientifically sound data, assumptions, and analysis. We received feedback from 16 of the 28 peer reviewers contacted. We have incorporated the results of these reviews, as appropriate, into the appropriate assessment forms and this final rule. Additionally, we have provided our responses to peer review feedback below, under Summary of Comments and Recommendations.

Summary of Changes From the Proposed Rule

In preparing this final rule, we reviewed and fully considered all applicable comments we received during the comment period from the peer reviewers and the public on the proposed rule to delist 23 species due to extinction. In this final rule, we are delisting 21 species due to extinction.

Due to new surveys conducted, we are withdrawing our proposed rule to remove *Phyllostegia glabra* var. *lanaiensis* from the List of Endangered and Threatened Plants; the document withdrawing the proposed delisting of *P. glabra* var. *lanaiensis* is published elsewhere in this issue of the **Federal Register**.

On July 7, 2022, we published in the **Federal Register** (87 FR 40477) a 6-month extension of the final determination on whether to delist the ivory-billed woodpecker (*Campephilus principalis*). That document also reopened the public comment period on the proposed delisting of the ivory-billed woodpecker. We extended the final determination on the proposed delisting of this species due to substantial disagreement among scientists knowledgeable about the species regarding the sufficiency or accuracy of the available data relevant to the determination. In a separate, future publication, we will either finalize the delisting of the ivory-billed woodpecker due to extinction or withdraw the proposed delisting of this species and retain the species' status as an endangered species.

Lastly, in the proposed rule regulation § 17.95 for the Eleven Mobile River Basin Mussel Species Critical Habitat designation, we had identified the orange-nacre mucket under the name *Lampsilis perovalis.* We have corrected this to the name the species was listed under, *Hamiota perovalis.*

Summary of Comments and Recommendations

In the proposed rule published on September 30, 2021 (86 FR 54298), we requested that all interested parties submit written comments on the proposal by November 29, 2021. We also contacted appropriate State agencies, scientific experts and organizations, and other interested parties and invited them to comment on the proposal. A newspaper notice inviting the public to provide comments was published in USA Today on October 8, 2021. We received a request for a public hearing for the ivory-billed woodpecker on November 10, 2021. A newspaper notice inviting the public to provide comments at the public hearing was published in USA Today on January 11, 2022. A public hearing was conducted on January 26, 2022. All applicable substantive information we received during the comment period has been incorporated directly into this final determination and the appropriate species assessment forms or is addressed below.

Of the public comments we received on the proposed rule, the majority concerned the ivory-billed woodpecker. We will address those comments in a separate, future publication. Of the public comments related to the other 22 species, two included substantive comments that are summarized below and incorporated into this final rule and the associated species assessment forms, as appropriate.

Peer Reviewer Comments

In accordance with our 1994 peer review policy, we solicited expert opinion from knowledgeable individuals with scientific expertise that included familiarity with these species and their habitat, biological needs, and threats. As stated above, we sought peer review for species whose 5-year reviews had not been previously peer reviewed. We reviewed all comments received from peer reviewers for substantive issues and new information regarding these species. The reviewers made suggestions and comments that strengthened our analysis and improved this final rule.

For the Bachman's warbler, we sent the 5-year reviews to a total of three peer reviewers. We received responses from all three reviewers. Peer reviewers provided additional information on the biological background information of the species. We have incorporated the information into both this rule and the supporting documents.

For the Scioto madtom, we sent the 5-year review to a total of three peer reviewers. We received responses from all three reviewers. Peer reviewers provided clarification on the results of prior surveys that were conducted. We have incorporated the information into this rule and the supporting documents.

For the San Marcos gambusia, we sought the expert opinions of three specialists with expertise in biology, habitat, and threats to the species, and we received responses from all three experts. Two peer reviewers confirmed that San Marcos gambusia should be delisted due to extinction, and the third peer reviewer had minor editorial

comments that were incorporated, where appropriate, into this rule and the supporting documents. The peer reviewers did not provide any additional substantial information that would influence a change in our decision from the proposed rule.

For the Hawaiian and Mariana Islands species, we sought the expert opinion of a total of 11 individuals with expertise in the biology, habitat, and threats to the species. Six reviewers provided comments and feedback. We have organized and addressed those comments below.

Little Mariana Fruit Bat

(1) Comment: One peer reviewer noted that the related, larger-bodied Mariana fruit bat (called fanihi in the Chamorro language) moves between Rota and Guam, stating that Rota has larger populations of the species compared to Guam, but that large groups of fanihi can be observed on Guam when Rota experiences storms. The reviewer wondered whether, similarly, the little Mariana fruit bat could be present on Rota and move between Rota and Guam.

Response: We conclude that it is extremely unlikely that the little Mariana fruit bat has persisted undetected on Rota or Guam considering the tremendous amount of effort that has gone into monitoring the fanihi on those islands.

(2) Comment: One peer reviewer asked how environmental threats such as typhoons might impact little Mariana fruit bat populations and hypothesized that if the little Mariana fruit bat and the fanihi were to have roosted together, the fanihi may have contributed to the decline of the little Mariana fruit bat by outcompeting for resources following typhoon or other similar environmental events.

Response: We noted possible vulnerabilities of the little Mariana fruit bat to typhoons and other environmental factors under ''Threats Evaluation'' in the species' 5-year review (USFWS 2019, p. 4). If the little Mariana fruit bat exhibited traits similar to that of other *Pteropus* spp., including low fecundity, it would have been susceptible to most large-scale disturbances to its habitat, particularly typhoons. However, too little is known about the little Mariana fruit bat's biology for us to speculate about the outcome of possible competition with the fanihi for resources following events such as typhoons.

(3) Comment: One peer reviewer asked about the potential for using genetics to determine whether the bats present on Guam and Rota represent a single species and whether the little Mariana fruit bat is truly extinct on both islands.

Response: As noted in our 5-year review for the little Mariana fruit bat, genetic analysis of skin samples of *Pteropus* spp. concluded that the species was genetically distinct (Almeida et al. 2014, entire). We would welcome any new genetic information about the fanihi or the little Mariana fruit bat should it become available, but in the absence of this information, we conclude that the best available information indicates that the little Mariana fruit bat is extinct.

Hawaiian Islands Bird Species

(4) Comment: One peer reviewer mentioned that the referenced searches for po'ouli in Kīpahulu Valley (1997–1999) relied primarily on existing trails from which it is not possible to adequately survey the entire area of rainforest habitat where po'ouli could still potentially persist. The reviewer further stated that Kīpahulu Valley (and much of the east Maui rainforest) has many steep gulches and frequently dense and impenetrable vegetation and stream beds, and the area is very difficult to cover adequately on foot, adding further difficultly to survey efforts.

Response: Specific searches to locate Maui's rarest forest birds were undertaken in 1967 and 1981 in Kīpahulu Valley, and variable circular-plot (VCP) counts were conducted in 1980, 1992, and 1996 along Hawaii Forest Bird Survey (HFBS) transects in rainforests of Maui's east region (Reynolds and Snetsinger 2001, p. 139). Variable circular plot (VCP) studies are surveys conducted at pre-established stations along transects. A surveyor counts all birds seen and heard during an 8-minute count period and estimates the distance from the count station to each bird seen or heard. From this information, the VCP studies estimate the number of birds in a surveyed area, along with a confidence interval for the estimate. Despite these searches, the po'ouli has never been found in Kīpahulu Valley and is known historically only from the Hanawi Natural Area Reserve (NAR) of northeast Maui (Scott et al. 1986, p. 183), where it was most recently observed in 2003 and 2004 (USFWS 2006, pp. 2–153–2–154). Collectively, the weight of evidence indicates that the po'ouli is extinct.

(5) Comment: One peer reviewer indicated that po'ouli is extremely cryptic and moves quietly through the understory and canopy. This species could easily be missed by inexperienced observers not familiar with the bird's behavior and is even easy to miss for experienced observers searching in known occupied habitat.

Response: After the continued existence of five to six po'ouli was confirmed in 1994–1995 in the Kūhiwa drainage of Hanawi NAR, thorough surveys of the species' historical range were conducted from 1995 to 1997, with 81 sightings of five individual po'ouli (Baker et al. 2001, p. 144). In 1997, only three individual birds were found in three separate territories, and one individual was color-banded in 1997. The po'ouli was last observed in 2003 and 2004 (USFWS 2006, pp. 2–153–2–154) and despite extensive time in the area from 2006 to 20011, no other birds have been located since these surveys. Using 2004 as the last reliable observation record for po'ouli, 2005 is estimated to be the year of extinction, with 2008 as the upper 95 percent confidence bound on that estimate (Elphick et al. 2010, p. 620). It is extremely unlikely that the po'ouli has persisted undetected considering extensive search efforts to document presence of the species on Maui.

(6) Comment: One peer reviewer indicated that extensive searches for birds on the island of Maui were not conducted at elevations where higher presence of avian disease is expected, based on the assumption that rare bird species would not persist because of the threat of avian malaria.

Response: The Rare Bird Search (RBS) on east Maui was conducted at elevations as low as 3,280 feet (1,000 meters), which is well within the zone of higher prevalence of avian malaria (Reynolds and Snetsinger 2001, p. 134). We have added this information to the species accounts of the Maui forest birds in this final rule.

(7) Comment: One peer reviewer indicated that the traditional VCP survey methods are not effective for detecting rarer, patchily distributed birds and particularly ineffective for a species like the po'ouli, which vocalizes infrequently and sounds similar to both Maui parrotbill (*Pseudonestor xanthophrys*) and Maui creeper (*Paroreomyza montana*). The reviewer further stated that confirmation of po'ouli is primarily visual, which can be quite challenging given its dark coloration, the dense vegetation it inhabits, and the frequently inclement rainy/misty survey conditions.

Response: The VCP survey method does have limited effectiveness for detection of po'ouli. Because of this, we relied strongly on information from other sources including RBS and field studies conducted in Hanawi NAR in

the area of the only known historical population of po'ouli. Collectively, the weight of evidence indicates that the po'ouli is extinct.

(8) Comment: One peer reviewer asked that we better define what is meant by ''extensive presence'' and ''qualified observers'' in reference to personnel conducting forest bird research in the field.

Response: While working on Maui parrotbill (also called kiwikiu) recovery from 2006 to 2011, personnel with the Maui Forest Bird Recovery Project (MFBRP) spent thousands of person hours (*i.e.,* extensive presence) in the area of the last po'ouli sightings. These personnel (*i.e.,* qualified observers) who conducted this field work were highly trained to be able to detect all species of Hawaiian forest birds by sight and sound.

(9) Comment: One peer reviewer recommended exploring some of the newer survey design methods and analyses (*e.g.,* occupancy estimation) for rare species and to further develop and optimize sampling protocols for rarer bird species like po'ouli, Maui akepa, and Maui nukupuu.

Response: Exploring possible application of different survey design methods and analyses and further developing and optimizing sampling protocols for rarer bird species will be taken into consideration for future survey and sampling efforts. However, we determined that the methods we used to determine absence of rare species are robust, and we have high confidence in our conclusion that the Hawaiian forest birds that are addressed in this rule are extinct.

(10) Comment: One peer reviewer indicated that the three types of surveys/searches used to detect po'ouli each have their own inherent strengths and weaknesses. The commenter stated that although the protocols for two of the surveys/searches (VCP and RBS) are described, protocols and analytical techniques for additional surveys conducted within Hanawi NAR and elsewhere on east Maui are not described.

Response: The third type of survey/search is best described as the long-term presence of qualified personnel doing field work in an area where rare species could still persist. While working on Maui parrotbill (kiwikiu) recovery from 2006 to 2011, personnel with the MFBRP spent thousands of person hours in the area of the last po'ouli sightings. Much of this consisted of active searches for kiwikiu, observations of this species when it was detected, and other types of conservation work in the area. Personnel who conducted field work were highly trained to be able to detect all species of Hawaiian forest birds by sight and sound. After thousands of hours of working in the Hanawi NAR in areas where po'ouli, Maui akepa, and Maui nukupuu were last detected, and no detections of these species occurred, MFBRP was strongly confident that po'ouli, Maui akepa, and Maui nukupuu are no longer present (Mounce 2021, pers. comm.).

Public Comments

Flat Pigtoe, Stirrupshell, Southern Acornshell, Upland Combshell

(11) Comment: One commenter indicated that we prematurely concluded that the mussel species are extinct, stating that the species could possibly be found in places that have not yet been surveyed. The commenter asked that we study the species longer before they are declared extinct and removed from the List.

Response: We deemed each of the species (flat pigtoe, stirrupshell, southern acornshell, and upland combshell) extinct based on significant alteration of all known historical habitat and lack of detections during numerous surveys conducted throughout each species' range.

For the flat pigtoe, surveys in historical habitat over the past three decades have failed to locate the species, and all historical habitat is impounded or modified by channelization and impoundments (USFWS 2015, p. 5). No live or freshly dead shells have been observed since the species was listed in 1987. Surveys between 1990–2001, and in 2002, 2003, 2009, 2011, and 2015, of potential habitat throughout the historical range, including intensive surveys of the Gainesville Bendway, where adequate habitat and flows may still occur below the Gainesville Dam on the Tombigbee River in Alabama, have failed to find any live or dead flat pigtoes (USFWS 2000, p. 81). Lack of finding the flat pigtoe despite extensive survey efforts in many habitats indicate that the species is extinct.

For the stirrupshell, over the past three decades, repeated surveys (circa 1988, 1998, 2001, 2002, 2003, 2006, 2011) of unimpounded habitat in the Sipsey and Tombigbee Rivers, including intensive surveys of the Gainesville Bendway, have failed to find any evidence of stirrupshell (Service 2009, p. 6; Service 2015, p. 7). The stirrupshell was also known from the Alabama River; however, over 92 hours of dive- bottom time were expended searching appropriate habitats for imperiled mussel species between 1997–2007 without encountering the species (Service 2009, p. 6), and a survey of the Alabama River in 2011 also did not find stirrupshell (Service 2015, p. 5). Surveys of the Black Warrior River in 1993 and from 2009–2012 (16 sites) focused on finding federally listed and State conservation concern priority mussel species but did not find any stirrupshells (Miller 1994, pp. 9, 42; McGregor et al. 2009, p. 1; McGregor et al. 2013, p. 1). The stirrupshell has not been found alive in the Black Warrior River or the Alabama River since the early 1980s (Service 1989, p. 3). The stirrupshell has not been collected alive since the Sipsey River was surveyed in 1978 (Service 1989, p. 4); one freshly dead shell was last collected from the Sipsey River in 1986 (Service 2000, p. 85). In the Tombigbee River, the stirrupshell has not been collected alive since completion of the Tennessee-Tombigbee Waterway in 1984 (Service 2015, p. 7). Mussel surveys within the Tombigbee River drainage during 1984–2015 failed to document the presence of the stirrupshell (Service 2015, p. 8). Lack of finding the stirrupshell despite extensive survey efforts in many habitats indicate that the species is extinct.

For the southern acornshell, many well-planned, comprehensive surveys by experienced State and Federal biologists have not been able to locate extant populations of southern acornshell (Service 2000, p. 57; Service 2008, p. 20; Service 2018, p. 7). Both the 2008 and 2018 5-year reviews reference multiple surveys by experienced Federal, State, and private biologists—17 survey reports from 1993–2006 and 6 survey reports from 2008–2017—and despite these repeated surveys of historical habitat in both the Coosa and Cahaba River drainages, no living animals or fresh or weathered shells of the southern acornshell have been located (Service 2008, p. 19; Service 2018, p. 6). The most recent records for the southern acornshell were from tributaries of the Coosa River in 1966–1968 and 1974, and the Cahaba River in 1938 (58 FR 14330 at 14331, March 17, 1993; Service 2008, p. 19; Service 2018, p. 5). No living populations of the southern acornshell have been located since the 1970s (Service 2000, p. 57; Service 2008, p. 20; Service 2018, p. 7). No live or freshly dead shells have been observed since the species was listed in 1987 (Service 2009, p. 6; Service 2015, p. 7). A freshly dead shell was last collected from the lower Sipsey River in 1986 (Service 2000, p. 85). Lack of finding the southern acornshell despite extensive survey efforts in many

habitats indicate that the species is extinct.

For the upland combshell, the species was last collected in the Black Warrior River drainage in the early 1900s; in the Coosa River drainage in 1986, from the Conasauga River near the Georgia/Tennessee State line; and the Cahaba River drainage in the early 1970s (58 FR 14330 at 14331, March 17, 1993; Service 2000, p. 61; Service 2018, p. 5). Both the 2008 and 2018 5-year reviews reference multiple surveys by experienced Federal, State, and private biologists—18 survey reports from 1993–2006 and 10 survey reports from 2008–2017—and despite these repeated surveys of historical habitat in the Black Warrior, Cahaba, and Coosa River drainages, no living animals or fresh or weathered shells of the upland combshell have been located (Service 2008, p. 19; Service 2018, p. 5). The most recent records for the upland combshell are many decades old: from tributaries of the Black Warrior in early 1900s, from the Cahaba River drainage in the early 1970s, and from the Coosa River drainage in the mid-1980s (58 FR 14330 at 14331, March 17, 1993; Service 2008, p. 19; Service 2018, p. 5). No living populations of the upland combshell have been located since the mid-1980s (Service 2000, p. 61; Service 2008, p. 20; Service 2018, p. 7). Lack of finding the upland combshell despite extensive survey efforts in many habitats indicate that the species is extinct.

Background

Section 4(c) of the Act (16 U.S.C. 1531 *et seq.*) requires the Secretary of the Interior to publish and maintain lists of endangered and threatened species. This includes delisting species that are extinct based on the best scientific and commercial data available. The Service can decide to delist a species due to extinction on its own initiative, as a result of a 5-year review under section 4(c)(2) of the Act, or because we are petitioned to delist.

Congress made clear that an integral part of the statutory framework is for the Service to make delisting decisions when appropriate and to revise the Lists of Endangered and Threatened Wildlife and Plants accordingly. For example, section 4(c)(1) of the Act requires the revision of the Lists of Endangered and Threatened Wildlife and Plants to reflect recent determinations, designations, and revisions. Similarly, section 4(c)(2) requires review of those Lists at least every 5 years; determination(s), based on those reviews, whether any species should be delisted or reclassified; and, if so, the application of the same standards and procedures as for listings under sections 4(a) and 4(b) of the Act. Finally, to make a finding that a particular action is warranted but precluded, the Service must make two determinations: (1) That the immediate proposal and timely promulgation of a final regulation is precluded by pending proposals to determine whether any species is endangered or threatened; and (2) that expeditious progress is being made to add qualified species to either of the Lists and to remove species from the Lists (16 U.S.C. 1533(b)(3)(B)(iii)). Delisting species that will not benefit from the Act's protections because they are extinct allows us to allocate resources responsibly for on-the-ground conservation efforts, recovery planning, 5-year reviews, and other protections for species that are extant and will therefore benefit from those actions.

Regulatory and Analytical 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.

In 2019, jointly with the National Marine Fisheries Service, the Service issued a final rule that revised the regulations in 50 CFR part 424 regarding how we add, remove, and reclassify endangered and threatened species and the criteria for designating listed species' critical habitat (84 FR 45020; August 27, 2019).

Under the Act, we must review the status of all listed species at least once every 5 years. We must delist a species if we determine, on the basis of the best available scientific and commercial data, that the species is neither a threatened species nor an endangered species. Our regulations at 50 CFR 424.11(e) identify three reasons why we might determine that a listed species is neither an endangered species nor a threatened species: (1) The species is extinct; (2) the species does not meet the definition of an endangered species or a threatened species; or (3) the listed entity does not meet the statutory definition of a species.

In this final rule, we use the commonly understood biological definition of ''extinction'' as meaning that no living individuals of the species remain in existence. A determination of extinction will be informed by the best available information to indicate that no individuals of the species remain alive, either in the wild or captivity. This is in contrast to ''functional extinction,'' where individuals of the species remain alive, but the species is no longer viable and/or no reproduction will occur (*e.g.,* any remaining females cannot reproduce, only males remain, etc.).

In our analyses, we attempted to minimize the possibility of either (1) prematurely determining that a species is extinct where individuals exist but remain undetected, or (2) assuming the species is extant when extinction has already occurred. Our determinations of whether the best available information indicates that a species is extinct included an analysis of the following criteria: detectability of the species, adequacy of survey efforts, and time since last detection. All three criteria require taking into account applicable aspects of species' life history. Other lines of evidence may also support the determination and be included in our analysis.

In conducting our analyses of whether these species are extinct, we considered and thoroughly evaluated the best scientific and commercial data available. We reviewed the information available in our files, and other available published and unpublished information. These evaluations may include information from recognized experts; Federal, State, and Tribal governments; academic institutions; foreign governments; private entities; and other members of the public.

The 5-year reviews of these species contain more detailed biological information on each species. This supporting information can be found on the internet at *https://www.regulations.gov* under the appropriate docket number (see table under **ADDRESSES**, above). The following information summarizes the analyses for each of the species delisted by this rule.

Summary of Biological Status and Threats

Mammals

Little Mariana Fruit Bat (Pteropus Tokudae)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On August 27, 1984, we listed the little Mariana fruit bat as endangered (49 FR 33881). The most recent 5-year status review completed in 2019 (initiated on May 7, 2018; see 83 FR 20088) recommended delisting due to extinction likely resulting from habitat loss, poaching, and predation by the brown tree snake (*Boiga irregularis*) (USFWS 2019, entire). This recommendation was based on an assessment of all available

information for the species, coupled with an evaluation of population trends and threats affecting the larger, extant Mariana fruit bat, which likely shares similar behavioral and biological traits and provides important context for the historical decline of the little Mariana fruit bat.

The little Mariana fruit bat was first described from a male type specimen collected in August 1931 (Tate 1934, p. 1). Its original scientific name, *Pteropus tokudae,* remains current. Only three confirmed observations of the little Mariana fruit bat existed in the literature based on collections of three specimens: two males in 1931 (Tate 1934, p. 3), and a female in 1968 (Perez 1972, p. 146), all on the island of Guam where it was presumably endemic. Despite the dearth of confirmed collections and observations, two relatively recent studies have confirmed the taxonomic validity of the little Mariana fruit bat, via morphology (Buden et al. 2013, entire) and genetics (Almeida et al. 2014, entire).

The little Mariana fruit bat was always likely rare, as suggested by written accounts of the species first recorded in the early 1900s (Baker 1948, p. 54; Perez 1972, pp. 145–146; Wiles 1987, p. 154). In addition to possibly having been inherently rare, as indicated by the literature, a concurrent decline in the little Mariana fruit bat population likely occurred during the well-documented decrease in Mariana fruit bat abundance on Guam in the 1900s. In 1920, it was ''not an uncommon sight'' to see fruit bats flying over the forest during the daytime in Guam (Wiles 1987, p. 150). Just 10 years later (when the first two little Mariana fruit bat specimens were collected), fruit bats were uncommon on the island (Wiles 1987, p. 150), and were found mostly in northern Guam; introduced firearms may have been a contributing factor in their decline because they increased the efficiency of hunting (Wiles 1987, p. 150).

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

The little Mariana fruit bat was much smaller than the related Mariana fruit bat (Tate 1934, p. 2; Perez 1972, p. 146; Buden et al. 2013, pp. 109–110). Adult bats measured approximately 5.5 to 5.9 inches (in) (14 to 15.1 centimeters (cm)) in head-body length, with a wingspan of approximately 25.6 to 27.9 in (650 to 709 millimeters (mm)). The adults weighed approximately 5.36 ounces (152 grams). Although primarily dark brown in color, the little Mariana fruit bat showed some variation on the neck and head, which could appear pale gold and grayish or yellowish-brown in color. Because of their small size (O'Shea and Bogan 2003, pp. 49, 254; USFWS 2009, p. 55), it is possible that adult little Mariana fruit bats were historically confused with juvenile Mariana fruit bats. Therefore, historical accounts of the species may have been underrepresented (Perez 1972, p. 143; Wiles 1987, p. 15).

The challenges of surveying for the Mariana fruit bat and most *Pteropus* spp. (including, in theory, the little Mariana fruit bat) are numerous. Mariana fruit bats sleep during the day in canopy emergent trees, either solitarily or within colonial aggregations that may occur across several acres (O'Shea and Bogan 2003, p. 254; Utzurrum et al. 2003, p. 49; USFWS 2009, p. 269). The tropical islands where many tropical fruit bats (*Pteropus* spp.) are located have widely diverse and steeply topographical habitat, making surveys difficult. Additionally, most *Pteropus* spp. choose roost sites (both colonial and individual) that occur in locations difficult for people to reach, such as adjacent to steep cliffsides in remote forest areas (Wilson and Graham 1992, p. 65). The selection of roost sites in these areas is likely both a result of their evolved biology (for example, to take advantage of updrafts for flight) (Wilson and Graham 1992, p. 4) and possible learned behavior to avoid poachers (USFWS 2009, pp. 24–25; Mildenstein and Johnson 2017, p. 36). To avoid triggering this avoidance behavior, surveyors must generally keep a distance of 164 feet (50 meters) and survey only downwind of roost sites (Mildenstein and Boland 2010, pp. 12–13; Mildenstein and Johnson 2017, pp. 55, 86). Additionally, *Pteropus* spp. typically sleep during the day and do not vocalize, and flying individuals may be easily counted twice due to their foraging patterns (Utzurrum et al. 2003, p. 54).

Survey Effort

By 1945, fruit bats were difficult to locate even in the northern half of Guam, where they were largely confined to forested cliff lines along the coasts (Baker 1948, p. 54). During surveys conducted between 1963 and 1968, the Guam Division of Aquatic and Wildlife Resources (DAWR) confirmed that bats were declining across much of Guam and were absent in the south. It was also during these same field studies that the third and last little Mariana fruit bat was collected in northern Guam in 1968 (Baker 1948, p. 146).

Increased survey efforts during the late 1970s and early 1980s reported no confirmed sightings of the little Mariana fruit bat (Wheeler and Aguon 1978, entire; Wheeler 1979, entire; Wiles 1987, entire; Wiles 1987, pp. 153–154). In the final rule listing the little Mariana fruit bat as endangered (49 FR 33881; August 27, 1984), we noted that the species was on the verge of extinction and had not been verifiably observed after 1968. When we published a joint recovery plan for the little Mariana fruit bat and the Mariana fruit bat in 1990, we considered the little Mariana fruit bat already extinct based upon the available literature (USFWS 1990, p. 7).

During the 1990s, Mariana fruit bat numbers on Guam decreased and fatalities of immature bats increased, hypothesized to be a result of predation by the brown tree snake (Wiles et al. 1995, pp. 33–34, 39–42). With bat abundance continuing to decline in the 2000s, the island's Mariana fruit bat population currently fluctuates between 15 and 45 individuals (Mildenstein and Johnson 2017, p. 24; USFWS 2017, p. 54). Even if the little Mariana fruit bat persisted at undetectable numbers for some time after its last confirmed collection in 1968, it is highly likely the little Mariana fruit bat experienced the same pattern of decline that we are now seeing in the Mariana fruit bat.

Time Since Last Detection

As stated above, the little Mariana fruit bat was last collected in northern Guam in 1968 (Baker 1948, p. 146). Intensive survey efforts conducted by Guam DAWR and other researchers in subsequent decades have failed to locate the species. Decades of monthly (and, later, annual) surveys for the related Mariana fruit bat by qualified personnel in northern Guam have failed to detect the little Mariana fruit bat (Wheeler and Aguon 1978, entire; Wheeler 1979, entire; Wiles 1987, entire; Wiles 1987, pp. 153–154; USFWS 1990, p. 7).

III. Analysis

Like the majority of bat species in the genus *Pteropus,* specific biological traits likely exacerbated the little Mariana fruit bat's susceptibility to human activities and natural events (Wilson and Graham 1992, pp. 1–8). For example, low fecundity in the genus due to late reproductive age and small broods (1 to 2 young annually) inhibits population rebound from catastrophic events such as typhoons, and from slow progression of habitat loss and hunting pressure that we know occurred over time. The tendency of *Pteropus* bats to roost together in sizeable groups or colonies in large trees rising above the

surrounding canopy makes them easily detected by hunters (Wilson and Graham 1992, p. 4). Additionally, *Pteropus* bats show a strong tendency for roost site fidelity, often returning to the same roost tree year after year to raise their young (Wilson and Graham 1992, p. 4; Mildenstein and Johnson 2017, pp. 54, 68). This behavior likely allowed hunters and (later) poachers to easily locate and kill the little Mariana fruit bat and, with the introduction of firearms, kill them more efficiently (Wiles 1987, pp. 151, 154; USFWS 2009, pp. 24–25; Mildenstein and Johnston 2017, pp. 41–42). The vulnerability of the entire genus *Pteropus* is evidenced by the fact that 6 of the 62 species in this genus have become extinct in the last 150 years (including the little Mariana fruit bat). The International Union for Conservation of Nature (IUCN) categorizes an additional 37 species in this genus at risk of extinction (Almeida et al. 2014, p. 84).

In discussing survey results for the Mariana fruit bat in the late 1980s, experts wrote that the level of illegal poaching of bats on Guam remained extremely high, despite the establishment of several legal measures to protect the species beginning in 1966 (Wiles 1987, p. 154). They also wrote about the effects of brown tree snake predation on various fruit bat species (Savidge 1987, entire; Wiles 1987, pp. 155–156). To date, there is only one documented instance of the brown tree snake preying upon the Mariana fruit bat; in that case, three young bats were found within the stomach of a snake (Wiles 1987, p. 155). However, immature *Pteropus* pups are particularly vulnerable to predators between approximately 3 weeks and 3 months of age. During this timeframe, the mother bats stop taking their young with them while they forage in the evenings, leaving them alone to wait at their roost tree (Wiles 1987, p. 155).

Only three specimens of little Mariana fruit bat have ever been collected, all on the island of Guam, and no other confirmed captures or observations of this species exist. Based on the earliest records, the species was already rare in the early 1900s. Therefore, since its discovery, the little Mariana fruit bat likely experienced greater susceptibility to a variety of factors because of its small population size. Predation by the brown tree snake, alteration and loss of habitat, increased hunting pressure, and possibly competition with the related Mariana fruit bat for the same resources under the increasingly challenging conditions contributed to the species' decreased ability to persist.

It is highly likely the brown tree snake, the primary threat thought to be the driver of multiple bird and reptile species extirpations and extinctions on Guam, has been present throughout the little Mariana fruit bat's range for at least the last half-century, and within the last northern refuge in northern Guam since at least the 1980s. Because of its life history and the challenges presented by its small population size, we conclude that the little Mariana fruit bat was extremely susceptible to predation by the brown tree snake.

IV. Conclusion

At the time of listing in 1984, hunting and loss of habitat were considered the primary threats to the little Mariana fruit bat. The best available information now indicates that the little Mariana fruit bat is extinct. The species appears to have been vulnerable to pervasive, rangewide threats including habitat loss, poaching, and predation by the brown tree snake. Since its last detection in 1968, qualified observers have conducted surveys and searches throughout the range of the little Mariana fruit bat but have not detected the species. Available information indicates that the species was not able to persist in the face of anthropogenic and environmental stressors, and we conclude that the best available scientific and commercial information indicates that the species is extinct.

Birds

Bachman's Warbler (Vermivora Bachmanii)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On March 11, 1967, we listed the Bachman's warbler as endangered under the Endangered Species Preservation Act of 1966 (32 FR 4001), as a result of the loss of breeding and wintering habitat. Two 5-year reviews were completed for the species on February 9, 2007 (initiated on July 26, 2005; see 70 FR 43171), and May 6, 2015 (initiated on September 23, 2014; see 79 FR 56821). Both 5-year reviews recommended that if the species was not detected within the following 5 years, it would be appropriate to delist due to extinction.

The Bachman's warbler was first named in 1833 as *Sylvia bachmanii* based on a bird observed in a swamp near Charleston, South Carolina (American Ornithologists' Union (AOU) 1983, pp. 601–602). The species was found in the southeastern portions of the United States from the south Atlantic and Gulf Coastal Plains. Historically, the bulk of the species' population left the North American mainland each fall for Cuba and Isle of Pines (Dingle 1953, pp. 67–68, 72–73).

Migratory habitat preferences appear to have differed from winter and breeding habitat preferences in that the bird used or tolerated a wider range of conditions and vegetative associations during migration. Bachman's warbler typically nested in low, wet, forested areas containing variable amounts of water, but usually with some permanent water. Nests were typically found in shrubs low to the ground from late March through June, and average known clutch size was 4.2 (with a range of 3 to 5) (Hamel 2018, pp. 14–15). During the winter in Cuba, it was found in a wider variety of habitats across the island including forests, ranging from dry, semi-deciduous forests to wetlands, and even in forested urban spaces (Hamel 1995, p. 5). Life expectancy is unknown but was likely 7 years, which is the documented lifespan of the two species most closely related to Bachman's warbler, blue-winged warbler (*V. cyanoptera*) and golden-winged warbler (*V. chrysoptera*) (Gill et al. 2020 and Confer et al. 2020, respectively).

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

The Bachman's warbler was one of the smallest warblers, with a total length of 11.0 to 11.5 cm. Males were easy to distinguish from other warblers. However, the drab coloration of the females and immature birds made positive identification difficult (Hamel and Gauthreaux 1982, p. 235). Additionally, females were much more difficult to identify because variability in plumage was greater. Immature females were also most likely to be confused with other similarly drab warblers.

The song of the Bachman's warbler was a fast series of buzzy ''zeeps'' usually ending with a short, downward whistled note given by both sexes (Hamel 2020, Sounds and Vocal Behavior). This species may have been difficult to differentiate by call alone, as its call was somewhat reminiscent of the pulsating trill of the northern parula (*Parula americana*) (Curson et al. 1994, p. 95), and only four recordings exist, all from the 1950s (two cited in Hamel 2018, p. 32, and all four in Cornell Lab of Ornithology, Macaulay Library), to guide ornithologists on distinguishing it by sound.

Despite the fact that it could be mistaken for the northern parula, Bachman's warbler was of high interest to birders, and guides have been published specifically to aid in field identification (Hamel and Gauthreaux 1982, entire). As a result, substantial informal and formal effort has been expended searching for the bird and verifying potential sightings as outlined below (see ''Survey Effort'').

Survey Effort

Although Bachman's warbler was first described in 1833, it remained relatively unnoticed for roughly the next 50 years. Population estimates are qualitative in nature and range from rare to abundant (Service 1999, pp. 4–448). Populations were probably never large and were found in ''some numbers'' between 1890 and 1920, but afterwards populations appeared to be very low (Hamel 2018, pp. 16–18). For instance, several singing males were reported in Missouri and Arkansas in 1897 (Widmann 1897, p. 39), and Bachman's warbler was seen as a migrant along the lower Suwannee River in flocks of several species (Brewster and Chapman 1891, p. 127). The last confirmed nest was documented in 1937 (Curson et al. 1994, p. 96). A dramatic decline occurred sometime between the early 1900s and 1940 or 1950. Recognition of this decline resulted in the 1967 listing of the species (see 32 FR 4001; March 11, 1967) under the Endangered Species Preservation Act of 1966.

Between 1975 and 1979, an exhaustive search was conducted in South Carolina, Missouri, and Arkansas. No Bachman's warblers were located (Hamel 1995, p. 10). The last (though unconfirmed) sighting in Florida was from a single bird observed near Melbourne in 1977. In 1989, an extensive breeding season search was conducted on Tensas National Wildlife Refuge in Louisiana. Six possible Bachman's warbler observations occurred but could not be documented sufficiently to meet acceptability criteria established for the study (Hamilton 1989, as cited in Service 2015, p. 4).

An experienced birder reported multiple, possible sightings of Bachman's warbler at Congaree National Park, South Carolina, in 2000 and 2001. These included hearing a male and seeing a female. In 2002, the National Park Service partnered with the Service and the Atlantic Coast Joint Venture to investigate these reports. Researchers searched over 3,900 acres of forest during 166 hours of observation in March and April; however, no Bachman's warbler sightings or vocalizations were confirmed. As noted previously, females and immature birds are difficult to positively identify. Males (when seen) are more easily distinguishable from other species. Researchers trying to verify the sightings traced several promising calls back to northern parulas and finally noted that they were confident the species would have been detected had it been present (Congaree National Park 2020, p. 3).

In several parts of the Bachman's warbler's range, relatively recent searches (since 2006) for ivory-billed woodpecker also prompted more activity in appropriate habitat for the Bachman's warbler. Much of the search period for ivory-billed woodpecker is during the winter, and the searches usually continued until the end of April, when the Bachman's warbler would be expected in its breeding range. Because the Bachman's warbler was a very early migrant, many knowledgeable searchers looking for ivory-billed woodpeckers would have had opportunities to encounter this warbler as early as February across the southeastern United States, yet no putative encounters were reported. Given that Bachman's warbler habitat overlaps with ivory-billed woodpecker habitat, the probability that the Bachman's warbler would be detected, if present, has recently increased (Service 2015, pp. 5–6). Further, in general, substantial informal effort has been expended searching for the Bachman's warbler because of its high interest among birders (Service 2015, p. 5). Despite these efforts, the Bachman's warbler has not been observed in the United States in more than three decades. With a likely maximum lifespan of 7 years, the time period through which this species has not been seen constitutes at least 7 generations, and the time period since its last confirmed breeding constitutes more than 10 generations.

In Cuba, the species' historical wintering range, the last ornithologist to see the species noted that the species was observed twice in the 1960s in the Zapata Swamp: one sighting in the area of a modern-day hotel in Laguna del Tesoro and the other one in the Santo Tomas, Zanja de la Cocodrila area. Some later potential observations (*i.e.,* 1988) in the same areas were thought to be a female common yellowthroat (*Geothlypis trichas*) (Navarro 2020, pers. comm.). A single bird was reported in Cuba in 1981 at Zapata Swamp (Garrido 1985, p. 997; Hamel 2018, p. 20). However, additional surveys in Cuba by Hamel and Garrido in 1987 through 1989 did not confirm additional birds (Navarro 2020, pers. comm.). There have been no sightings or bird surveys in recent years in Cuba, and all claimed sightings of Bachman's warbler from 1988 onwards have been rejected by the ornithological community (Navarro 2020, pers. comm.). Curson et al. (1994, p. 96) considers all sightings from 1978 through 1988 in Cuba as unconfirmed.

Time Since Last Detection

After 1962, reports of the Bachman's warbler in the United States have not been officially accepted, documented observations (Chamberlain 2003, p. 5). Researchers have been thorough and cautious in verification of potential sightings, and many of the more recent ones could not be definitively verified. Bachman's warbler records from 1877–2001 in North America are characterized as either relying on physical evidence or on independent expert opinion, or as controversial sightings (Elphick et al. 2010, pp. 8, 10). In Cuba, no records have been verified since the 1980s (Navarro 2020, pers. comm.).

Other Considerations Applicable to the Species' Status

At breeding grounds, the loss of habitat from clearing of large tracts of palustrine (*i.e.,* having trees, shrubs, or emergent vegetation) wetland beginning in the 1800s was a major factor in the decline of the Bachman's warbler. Most of the palustrine habitat in the Mississippi Valley (and large proportions in Florida) was historically converted to agriculture or affected by other human activities (Fretwell et al. 1996, pp. 8, 10, 124, 246). Often the higher, drier portions of land that the Bachman's warbler required for breeding were the first to be cleared because they were more accessible and least prone to flooding (Hamel 1995, pp. 5, 11; Service 2015, p. 4).

During World Wars I and II, many of the remaining large tracts of old growth bottomland forest were cut, and the timber was used to support the war effort (Jackson 2020, Conservation and Management, p. 2). At the wintering grounds of Cuba, extensive loss of primary forest wintering habitat occurred due to the clearing of large areas of the lowlands for sugarcane production (Hamel 2018, p. 24). Hurricanes also may have caused extensive damage to habitat and direct loss of overwintering Bachman's warblers. Five hurricanes occurred between November 1932 and October 1935. Two storms struck western Cuba in October 1933, and the November 1932 hurricane is considered one of the most destructive ever recorded. These hurricanes, occurring when Bachman's warblers would have been present at their wintering grounds in Cuba, may

have resulted in large losses of the birds (Hamel 2018, p. 19). The dramatic reduction in encounter frequency, beginning in the late 1930s following the string of hurricanes in Cuba, never reversed, strongly suggesting that these storms, combined with accumulated habitat loss in breeding grounds, diminished viability of the Bachman's warbler as it approached extinction.

III. Analysis

As early as 1953, Bachman's warbler was reported as one of the rarest songbirds in North America (Dingle 1953, p. 67). The species may have gone extinct in North America by 1967 (Elphick et al. 2010, p. 619). Despite extensive efforts to document presence of the species, no new observations of the species have been verified in the United States or Cuba in several decades (Elphick et al. 2010, supplement; Navarro 2020, pers. comm.). Given the likely lifespan of the species, it has not been observed in several generations.

IV. Conclusion

As far back as 1977, Bachman's warbler has been described as being on the verge of extinction (Hooper and Hamel 1977, p. 373) and the rarest songbird native to the United States (Service 1999, pp. 4–445). The species has not been seen in the United States or Cuba since the 1980s, despite extensive efforts to locate it and verify potential sightings. Therefore, we conclude that the best available scientific and commercial information indicates that the species is extinct.

Bridled White-Eye (Zosterops Conspicillatus Conspicillatus)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On August 27, 1984, we listed the bridled white-eye (Nossa in the Chamorro language) as endangered (49 FR 33881). The species was last observed in 1983, and the 1984 final listing rule for the bridled white-eye noted that the species ''may be the most critically endangered bird under U.S. jurisdiction'' (49 FR 33881, August 27, 1984, p. 49 FR 33883), citing disease and predation by nonnative predators, including the brown tree snake, as the likely factors contributing to its rarity (49 FR 33881, August 27, 1984, p. 49 FR 33884). The most recent 5-year status review, completed in 2019 (initiated on May 7, 2018; see 83 FR 20088), recommended delisting due to extinction, based on continued lack of detections and the pervasive rangewide threat posed by the brown tree snake (USFWS 2019, p. 10).

At the time of listing, the bridled white-eye on Guam was classified as one subspecies within a complex of bridled white-eye populations found in the Mariana Islands. The most recent taxonomic work (Slikas et al. 2000, p. 360) continued to classify the Guam subspecies within the same species as the bridled white-eye populations currently found on Saipan, Tinian, and Aguiguan in the Commonwealth of the Northern Mariana Islands (*Z. c. saypani*) but considered the Rota population (*Z. rotensis;* now separately listed as endangered under the Act) to be a distinct species.

Endemic only to Guam, within the Mariana Islands, the bridled white-eye was a small (0.33 ounce or 9.3 grams), green and yellow, warbler-like forest bird with a characteristic white orbital ring around each eye (Jenkins 1983, p. 48). The available information about the life history of the species is sparse, based on a few early accounts in the literature (Seale 1901, pp. 58–59; Stophlet 1946, p. 540; Marshall 1949, p. 219; Baker 1951, pp. 317–318; Jenkins 1983, pp. 48–49). Nonterritorial and often observed in small flocks, the species was a canopy-feeding insectivore that gleaned small insects from the twigs and branches of trees and shrubs (Jenkins 1983, p. 49). Although only minimal information exists about the bridled white-eye's nesting habits and young, observations of nests during several different months suggests the species bred year-round (Marshall 1949, p. 219; Jenkins 1983, p. 49). No information is available regarding longevity of the bridled white-eye, but lifespans in the wild for other white-eyes in the same genus range between 5 and 13 years (Animal Diversity Web 2020; The Animal Aging and Longevity Database 2020; *WorldLifeExpectancy.com* 2020).

The bridled white-eye was reported to be one of the more common Guam bird species between the early 1900s and the 1930s (Jenkins 1983, p. 5). However, reports from the mid- to late-1940s indicated the species had perhaps become restricted to certain areas on Guam (Baker 1951, p. 319; Jenkins 1983, p. 50). By the early- to mid-1970s, the bridled white-eye was found only in the forests in the very northern portion of Guam (Wiles et al. 2003, p. 1353). It was considered rare by 1979, causing experts to conclude that the species was nearing extinction (Jenkins 1983, p. 50).

By 1981, the bridled white-eye was known to inhabit only a single 395-acre (160-hectare) limestone bench known as Pajon Basin in a limestone forest at Ritidian Point, an area that later became the Guam National Wildlife Refuge. Nestled at the base of towering limestone cliffs of about 426 feet (130 meters), the site was bordered by adjoining tracts of forest on three sides, and ocean on the northern side (Wiles et al. 2003, p. 1353). Pajon Basin was also the final refuge for many of Guam's native forest bird species and was the last place where 10 of Guam's forest bird species were still observed together in one locality at historical densities (Savidge 1987, p. 661; Wiles et al. 2003, p. 1353).

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

The bridled white-eye was described as active and occurred in small flocks of 3 to 12 individuals (Jenkins 1983, p. 48). Although apparently not as vocal as its related subspecies on the other Mariana Islands, the bridled white-eye was observed singing and typically vocalized with ''chipping calls'' while flocking, less so during foraging (Jenkins 1983, p. 48). Although perhaps not correctly identified as a ''secretive'' or ''cryptic'' species (Amidon 2000, pp. 14–15), the detectability of the related Rota bridled white-eye is greatest during surveys when it is close to the observer, relative to other species of birds that are detected at further distances. While we are unaware of surveys for the bridled white-eye using alternative methodologies specific for rare or secretive bird species, we conclude there is still sufficient evidence of extinction based upon the large body of literature confirming the impacts of the brown tree snake on Guam (see discussion below under ''III. Analysis'').

Survey Effort

During a multi-year VCP study at Pajon Basin consisting of annual surveys between 1981 and 1987, observations of the bridled white-eye drastically declined in just the first 3 years of the study. In 1981, 54 birds were observed, and in 1982, 49 birds were documented, including the last observation of a family group (with a fledging) of the species. One year later, during the 1983 survey, only a single individual bridled white-eye was sighted. Between 1984 and 1987, researchers failed to detect the species within this same 300-acre (121-hectare) site (Beck 1984, pp. 148–149).

Between the mid- and late-1980s, experts had already begun to hypothesize that the bridled white-eye had become extinct (Jenkins 1983, p. 50;

Savidge 1987, p. 661). Although human access has become more restricted within portions of Andersen Air Force Base since 1983, the Guam DAWR has, to date, continued annual roadside counts across the island as well as formal transect surveys in northern Guam in areas previously inhabited by the bridled white-eye.

Time Since Last Detection

The species remains undetected since the last observation in Pajon Basin in 1983 (Wiles 2018, pers. comm.; Quitugua 2018, pers. comm.; Aguon 2018, pers. comm.). Researchers failed to observe the species at the Pajon Basin during the annual surveys between 1984 and 1987, and during subsequent intermittent avian surveys in northern Guam in areas where this species would likely occur (Savidge 1987, p. 661; Wiles et al. 1995, p. 38; Wiles et al. 2003, entire).

III. Analysis

The brown tree snake is estimated to be responsible for the extinction, extirpation, or decline of 2 bat species, 4 reptiles, and 17 of Guam's 22 (77 percent) native bird species, including all of the native forest bird species (Wiles et al. 2003, p. 1358; Rodda and Savidge 2007, p. 307). The most comprehensive study of the decline (Wiles et al. 2003, entire) indicated that 22 bird species were severely impacted by the brown tree snake. Observed bird species declines of greater than or equal to 90 percent occurred rapidly, averaging 8.9 years from invasion by the snake. Additionally, birds that nested and roosted in locations where the brown tree snake was uncommon had a greater likelihood of coexisting with the snake. Bird species with large clutch sizes and large body sizes also exhibited longer persistence, although large body size delayed but did not prevent extirpation. Measuring a mere 0.33 ounces (9.3 grams), the bridled white-eye was relatively small, and its nests occurred in areas accessible to brown tree snakes (Baker 1951, pp. 316–317; Jenkins 1983, pp. 49–50).

We used a recent analytical tool that assesses information on threats to infer species extinction based on an evaluation of whether identified threats are sufficiently severe and prolonged to cause local extinction, as well as sufficiently extensive in geographic scope to eliminate all occurrences (Keith et al. 2017, p. 320). Applying this analytical approach to the bridled white-eye, we examined years of research and dozens of scientific publications and reports that indicate that the effects of predation by the brown tree snake have been sufficiently severe, prolonged, and extensive in geographic scope to cause widespread range contraction, extirpation, and extinction for several birds and other species. Based on this analysis, we conclude that the bridled white-eye is extinct and brown tree snake predation was the primary causal agent.

IV. Conclusion

At the time of its listing in 1984, disease and predation by nonnative predators, including the brown tree snake, were considered the primary threats to the bridled white-eye. The best available information now indicates that the bridled white-eye is extinct. The species appears to have been vulnerable to the pervasive, rangewide threat of predation from the brown tree snake. Since its last detection in 1983, qualified observers have conducted surveys and searches throughout the range of the bridled white-eye and have not detected the species. Available information indicates that the species was not able to persist in the face of environmental stressors, and we conclude that the best available scientific and commercial information indicates that the species is extinct.

Kauai Akialoa (Akialoa Stejnegeri)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On March 11, 1967, we listed the Kauai akialoa (listed as *Hemignathus stejnegeri*), a Hawaiian honeycreeper, as endangered (32 FR 4001). This bird was included in the Kauai Forest Birds Recovery Plan (USFWS 1983, p. 1), and the Revised Recovery Plan for Hawaiian Forest Birds (USFWS 2006, p. 2–86). At the time of listing, we considered Kauai akialoa to have very low population numbers and to be threatened by habitat loss, avian disease, and predation by rats (*Rattus* spp.). The last confirmed observation of the species was in 1965, although there was an unconfirmed sighting in 1969 (Reynolds and Snetsinger 2001, p. 142). The most recent 5-year status review, completed in 2019, recommended delisting due to extinction based on consideration of additional information about the biological status of the species, as discussed below (USFWS 2019, pp. 5, 10).

The life history of Kauai akialoa is poorly known and based mainly on observations from the end of the 19th century (USFWS 2006, p. 2–86). There is no information on the lifespan of the Kauai akialoa nor its threats when it was extant. The species was widespread on Kauai and occupied all forest types above 656 feet (200 meters) elevation (Perkins 1903, pp. 369, 422, 426). Its historical range included nearly all Kauai forests visited by naturalists at the end of the 19th century. After a gap of many decades, the species was seen again in the 1960s, when one specimen was collected (Richardson and Bowles 1964, p. 30).

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

The Kauai akialoa was a large (6.7 to 7.5 inches, or 17 to 19 centimeters, total length), short-tailed Hawaiian honeycreeper with a very long, thin, curved bill, the longest bill of any historically known Hawaiian passerine. The plumage of both sexes was olive-green; males were more brightly colored, were slightly larger, and had a somewhat longer bill (USFWS 2006, p. 2–86). The Kauai akialoa's relatively large size and distinctive bill suggest that if it were extant, it would be detectable by sight and recognized.

Survey Effort

A comprehensive survey of Hawaiian forest birds was initiated in the 1970s using the VCP method (Scott et al. 1986, entire). Please refer to the ''Summary of Comments and Recommendations'' for a description of the VCP method. VCP surveys have been the primary method used to count birds in Hawaii; however, it is not appropriate for all species and provides poor estimates for extremely rare birds (Camp et al. 2009, p. 92). In recognition of this issue, the RBS was undertaken from 1994 to 1996, to update the status and distribution of 13 ''missing'' Hawaiian forest birds (Reynolds and Snetsinger 2001, pp. 134–137). The RBS was designed to improve efficiency in the search for extremely rare species, using the method of continuous observation during 20- to 30-minute timed searches in areas where target species were known to have occurred historically, in conjunction with audio playback of species vocalizations (when available). Several recent surveys and searches, including the RBS, have been unsuccessful in detecting Kauai akialoa despite intensive survey efforts by wildlife biologists from 1968 to 1973, and in 1981, 1989, 1993, 1994, 2000, 2005, and 2011 to 2018 (Hawaii Department of Land and Natural Resources unpubl. data; Reynolds and Snetsinger 2001, entire; Crampton et al.

2017, entire; Crampton 2018, pers. comm.). An unconfirmed 1969 report may have been the last sighting of Kauai akialoa (Conant et al. 1998, p. 15). Kauai akialoa has been presumed likely extinct for some time (Reynolds and Snetsinger 2001, p. 142).

In addition, extensive time has been spent by qualified observers in the historical range of the Kauai akialoa searching for the small Kauai thrush (*Myadestes palmeri*), akekee (*Loxops caeruleirostris*), and akikiki (or Kauai creeper) (*Oreomystis bairdi*). HFBSs were conducted in 1981, 1989, 1994, 2000, 2005, 2007, 2008, 2012, and 2018 (Paxton et al. 2016, entire; Paxton et al. 2020, entire). The Kauai Forest Bird Recovery Project (KFBRP) conducted occupancy surveys for the small Kauai thrush in Kokee State Park, Hono O NaPali NAR, Na Pali Kona Forest Reserve, and Alakai Wilderness Preserve, from 2011 to 2013 (Crampton et al. 2017, entire), and spent over 1,500 person-hours per year from 2015 to 2018 searching for akikiki and akekee nests. During the HFBS in 2012 and 2018, occupancy surveys and nest searches did not yield any new detections of Kauai akialoa. The KFBRP conducted mist-netting in various locations within the historical range of Kauai akialoa from 2006 through 2009, and from 2011 through 2018, and no Kauai akialoa were caught or encountered (Crampton 2018, pers. comm.).

Time Since Last Detection

The Kauai akialoa has not been seen since the 1960s, despite efforts by ornithologists (Conant et al. 1998, p. 15) and birders, and intensive survey efforts by wildlife biologists spanning 1968 to 2018 (USFWS 1983, p. 2; Hawaii Department of Land and Natural Resources unpubl. data; Reynolds and Snetsinger 2001, entire; Crampton et al. 2017, entire; Crampton 2018, pers. comm.). Another approach used to determine whether extremely rare species are likely extinct or potentially still extant is to calculate the probability of a species' extinction based on time (years) since the species was last observed (Elphick et al. 2010, p. 620). This approach, when applied to extremely rare species, has the drawback that an incorrect assignment of species extinction may occur due to inadequate survey effort and/or insufficient time by qualified observers spent in the area where the species could still potentially exist. Using 1969 as the last credible sighting of Kauai akialoa, the authors' estimated date for the species' extinction is 1973, with 95 percent confidence that the species was extinct by 1984.

III. Analysis

The various bird species in the subfamily Drepanidinae (also known as the Hawaiian honeycreepers), which includes Kauai akialoa, are highly susceptible to introduced avian disease. They are particularly susceptible to avian malaria (*Plasmodium relictum*), which results in high rates of mortality. At elevations below approximately 4,500 feet (1,372 meters) in Hawaii, the key factor driving disease epizootics (outbreaks) of pox virus (*Avipoxvirus*) and avian malaria is the seasonal and altitudinal distribution and density of the primary vector of these diseases, the mosquito *Culex quinquefasciatus* (Atkinson and Lapointe 2009a, pp. 237–238, 245–246).

We relied on a recently developed analytic tool that uses information on threats to infer species extinction based on an evaluation of whether identified threats are sufficiently severe and prolonged to cause local extinction, and sufficiently extensive in geographic scope to eliminate all occurrences (Keith et al. 2017, p. 320). The disappearance of many Hawaiian honeycreeper species over the last century from areas below approximately 4,500 feet elevation points to effects of avian disease having been sufficiently severe and prolonged, and extensive in geographic scope, to cause widespread species' range contraction and possible extinction. It is highly likely avian disease is the primary causal factor for the disappearance of many species of Hawaiian honeycreepers from forested areas below 4,500 feet on the islands of Kauai, Oahu, Molokai, and Lanai (Scott et al. 1986, p. 148; Banko and Banko 2009, pp. 52–53; Atkinson and Lapointe 2009a, pp. 237–238).

It is widely established that small populations of animals are inherently more vulnerable to extinction because of random demographic fluctuations and stochastic environmental events (Mangel and Tier 1994, p. 607; Gilpin and Soulé 1986, pp. 24–34). Formerly widespread populations that become small and isolated often exhibit reduced levels of genetic variability, which diminishes the species' capacity to adapt and respond to environmental changes, thereby lessening the probability of long-term persistence (*e.g.,* Barrett and Kohn 1991, p. 4; Keller and Waller 2002, p. 240; Newman and Pilson 1997, p. 361). As populations are lost or decrease in size, genetic variability is reduced, resulting in increased vulnerability to disease and restricted potential evolutionary capacity to respond to novel stressors (Spielman et al. 2004, p. 15261; Whiteman et al. 2006, p. 797). As numbers decreased historically, effects of small population size were very likely to have negatively impacted Kauai akialoa, reducing its potential for long-term persistence. Surveys and searches have been unsuccessful in detecting Kauai akialoa (refer to ''Survey Effort'' discussion, above).

IV. Conclusion

At the time of listing in 1967, the Kauai akialoa faced threats from habitat loss, avian disease, and predation by introduced mammals. The best available information now indicates that the Kauai akialoa is extinct. The species appears to have been vulnerable to introduced avian disease. In addition, the effects of small population size likely limited the species' genetic variation and adaptive capacity, thereby increasing the vulnerability of the species to environmental stressors including habitat loss and degradation. Since its last detection in 1969, qualified observers have conducted extensive surveys, and searches but have not detected the species. Available information indicates that the species was not able to persist in the face of environmental stressors, and we conclude that the best available scientific and commercial information indicates that the species is extinct.

Kauai Nukupuu (Hemignathus Hanapepe)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On March 11, 1967, we listed the Kauai nukupuu as endangered (32 FR 4001). This bird was included in the Kauai Forest Birds Recovery Plan (USFWS 1983, p. 1), as well as the Revised Recovery Plan for Hawaiian Forest Birds (USFWS 2006, p. viii). At the time of listing, observations of only two individuals had been reported during that century (USFWS 1983, p. 3). The last confirmed observation (based on independent expert opinion and physical evidence) of the species was in 1899 (Eliphick et al. 2010, p. 620). The latest 5-year status review completed in 2019 recommended delisting due to extinction based on consideration of additional information about the biological status of the species, as discussed below (USFWS 2019, pp. 4–5, 10).

The historical record provides little information on the life history of Kauai

nukupuu (USFWS 2006, p. 2–89). There is no specific information on the lifespan or breeding biology of Kauai nukupuu, although it is presumed to be similar to its closest relative, akiapolaau (*Hemignathus munroi,* listed as *H. wilsoni*), a honeycreeper from the island of Hawaii. The last confirmed observation (based on independent expert opinion and physical evidence) of Kauai nukupuu was in 1899 (Eliphick et al. 2010, p. 620); however, there was an unconfirmed observation in 1995 (Conant et al. 1998, p. 14).

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

Kauai nukupuu was a medium-sized, approximately 23-gram (0.78-ounce), Hawaiian honeycreeper (family Fringillidae, subfamily Drepanidinae) with an extraordinarily thin, curved bill, slightly longer than the bird's head. The lower mandible was half the length of the upper mandible. Adult male plumage was olive-green with a yellow head, throat, and breast, whereas adult female and immature plumage consisted of an olive-green head and yellow or yellowish gray under-parts (USFWS 2006, p. 2–89). The long, curved, and extremely thin bill of Kauai nukupuu, in combination with its brightly colored plumage, would have made this bird highly detectable to ornithologists and birders had it persisted (USFWS 2006, p. 2–89). No subsequent sightings or vocalizations have been documented since the unconfirmed sighting in 1995, despite extensive survey efforts.

Survey Effort

In the absence of early historical surveys, the extent of the geographical range of the Kauai nukupuu is unknown. Several recent surveys and searches, including the RBS, have been unsuccessful in detecting Kauai nukupuu despite intensive survey efforts by wildlife biologists from 1968 to 1973, and in 1981, 1989 1993, 1994, 2000, 2005, and 2011 to 2018 (Hawaii Department of Land and Natural Resources unpubl. data; Reynolds and Snetsinger 2001, entire; Crampton et al. 2017, entire; Crampton 2018 pers. comm.). During the RBS, Kauai nukupuu was not detected. The lack of detections combined with analysis of detection probability ($P \geq 0.95$) suggested that the possible population count was fewer than 10 birds in 1996 (Reynolds and Snetsinger 2001, p. 142).

Extensive time has been spent by qualified observers in the historical range of the Kauai nukupuu searching for the small Kauai thrush, akekee, and akikiki. HFBSs were conducted in 1981, 1989, 1994, 2000, 2005, 2007, 2008, 2012, and 2018 (Paxton et al. 2016, entire; Paxton et al. 2020, entire). During the HFBSs in 2012 and 2018, occupancy surveys and nest searches did not yield any new detections of the Kauai nukupuu. The KFBRP conducted mist-netting in various locations within the historical range of the Kauai nukupuu from 2006 through 2009, and from 2011 through 2018, and no Kauai nukupuu were caught or encountered (Crampton 2018, pers. comm.). Despite contemporary search efforts, the last credible sighting of Kauai nukupuu occurred in 1899.

Time Since Last Detection

Using 1899 as the last credible sighting of Kauai nukupuu based on independent expert opinion and physical evidence, the estimated date for the species' extinction was 1901, with 95 percent confidence that the species was extinct by 1906 (Elphick et al. 2010, p. 620).

III. Analysis

Some of the reported descriptions of this species better match the Kauai amakihi (*Chlorodrepanis stejnegeri*) (USFWS 2006, p. 2–90). Although skilled observers reported three unconfirmed sightings of Kauai nukupuu in 1995 (Reynolds and Snetsinger 2001, p. 142), extensive hours of searching within the historical range failed to detect any individuals. The last credible sightings of Kauai nukupuu was in 1899, based on independent expert opinion and physical evidence (Elphick et al. 2010, p. 620). It was estimated that 1901 was the year of extinction, with 95 percent confidence that the species was extinct by 1906. The species was likely vulnerable to the persistent threats of avian disease combined with habitat loss and degradation, which remain drivers of extinction for Hawaiian forest birds.

IV. Conclusion

At the time of listing in 1967, the Kauai nukupuu had not been detected for almost 70 years. Since its last detection in 1899, qualified observers have conducted extensive surveys and searches throughout the range of the Kauai nukupuu and have not detected the species. Available information indicates that the species was not able to persist in the face of environmental stressors, and we conclude that the best available scientific and commercial information indicates that the species is extinct.

Kauai ʻoʻo (Moho Braccatus)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On March 11, 1967, we listed the Kauai ʻoʻo (*Moho braccatus*) as endangered (32 FR 4001). This bird was included in the Kauai Forest Birds Recovery Plan (USFWS 1983, p. 1), as well as the Revised Recovery Plan for Hawaiian Forest Birds (USFWS 2006, p. viii). At the time of listing, the population size was estimated at 36 individuals (USFWS 1983, p. 3). Threats to the species included the effects of low population numbers, habitat loss, avian disease, and predation by introduced mammals. The last plausible record of a Kauai ʻoʻo was a vocal response to a recorded vocalization played by a field biologist on April 28, 1987, in the locality of Halepaakai Stream. The latest 5-year status review completed in 2019 recommended delisting due to extinction based on consideration of new information about the biological status of the species, as discussed below (USFWS 2019, pp. 5, 10).

The Kauai ʻoʻo measured 7.7 inches (19.5 centimeters) and was somewhat smaller than the *Moho* species on the other islands. It was glossy black on the head, wings, and tail; smoky brown on the lower back, rump, and abdomen; and rufous-brown on the upper tail coverts. It had a prominent white patch at the bend of the wing. The thigh feathers were golden yellow in adults and black in immature birds (Berger 1972, p. 107). The Kauai ʻoʻo is one of four known Hawaiian species of the genus *Moho* and one of five known Hawaiian bird species within the family Mohoidae (Fleischer et al. 2008, entire). Its last known habitat was the dense ohia (*Metrosideros polymorpha*) forest in the valleys of Alakai Wilderness Preserve. It reportedly fed on various invertebrates and the fruits and nectar from ohia, lobelia, and other flowering plants. There is no information on the lifespan of the Kauai ʻoʻo.

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

The vocalizations of this species were loud, distinctive, and unlikely to be overlooked. The song consisted of loud whistles that have been described as flute-like, echoing, and haunting, suggesting that detectability would be high in remaining suitable habitat if the

Kauai ʻoʻo still existed (USFWS 2006, p. 2–47).

Survey Effort

In the absence of early historical surveys, the extent of the geographical range of the Kauai ʻoʻo cannot be reconstructed. The comprehensive surveys of Hawaiian forest birds are described above under ''Survey Effort'' for the Kauai akialoa. Several recent surveys and searches, including the VCP and RBS, have been unsuccessful in detecting Kauai ʻoʻo despite intensive survey efforts by wildlife biologists from 1968 to 1973, and in 1981, 1989 1993, 1994, 2000, 2005, and 2011 to 2018 (Hawaii Department of Land and Natural Resources unpubl. data; Reynolds and Snetsinger 2001, entire; Crampton et al. 2017, entire; Crampton 2018 pers. comm.). During the RBS, coverage of the search area was extensive; therefore, there was a high probability of detecting a Kauai ʻoʻo. None were detected, and it was concluded the Kauai ʻoʻo was likely extinct ($P \geq 0.95$) (Reynolds and Snetsinger 2001, p. 142).

Extensive time has been spent by qualified observers in the historical range of the Kauai ʻoʻo searching for the small Kauai thrush, akekee, and akikiki. HFBSs were conducted in 1981, 1989, 1994, 2000, 2005, 2007, 2008, 2012, and 2018 (Paxton et al. 2016, entire; Paxton et al. 2020, entire). During the HFBSs in 2012 and 2018, occupancy surveys and nest searches did not yield any new detections of Kauai ʻoʻo. The KFBRP conducted mist-netting in various locations within the historical range for Kauai ʻoʻo from 2006 through 2009 and 2011 through 2018, and no Kauai ʻoʻo were caught or encountered (Crampton 2018, pers. comm.). The last credible sighting was in 1987.

Time Since Last Detection

Using 1987 as the last credible sighting of the Kauai ʻoʻo based on independent expert opinion, the estimated date for the species' extinction was 1991, with 95 percent confidence that the species was extinct by 2000 (Elphick et al. 2010, p. 620).

III. Analysis

The various bird species in the subfamily Drepanidinae (also known as the Hawaiian honeycreepers), which includes Kauai ʻoʻo, are highly susceptible to introduced avian disease, particularly avian malaria. At elevations below approximately 4,500 feet (1,372 meters) in Hawaii, the key factor driving disease epizootics of pox virus (*Avipoxvirus*) and avian malaria is the seasonal and altitudinal distribution and density of the primary vector of these diseases, the mosquito *Culex quinquefasciatus* (Atkinson and Lapointe 2009a, pp. 237–238, 245–246). Because they occur at similar altitudes and face similar threats, please refer to ''III. Analysis'' for the Kauai akialoa, above, for more information.

IV. Conclusion

At the time of listing in 1967, the Kauai ʻoʻo faced threats from effects of low population numbers, habitat loss, avian disease, and predation by introduced mammals. The best available information now indicates that the Kauai ʻoʻo is extinct. The species appears to have been vulnerable to introduced avian disease. In addition, the effects of small population size likely limited the species' genetic variation and adaptive capacity, thereby increasing the vulnerability of the species to environmental stressors including habitat loss and degradation. Since its last detection in 1987, qualified observers have conducted extensive surveys and searches and have not detected the species. Available information indicates that the species was not able to persist in the face of environmental stressors, and we conclude that the best available scientific and commercial information indicates that the species is extinct.

Large Kauai Thrush (Myadestes Myadestinus)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On October 13, 1970, we listed the large Kauai thrush (kamaʻo in the Hawaiian language) as endangered (35 FR 16047). This bird was included in the Kauai Forest Birds Recovery Plan (USFWS 1983, p. 1), as well as the Revised Recovery Plan for Hawaiian Forest Birds (USFWS 2006, p. viii). At the time of listing, the population size was estimated at 337 individuals (USFWS 1983, p. 3). Threats to the species included effects of low population numbers, habitat loss, avian disease, and predation by introduced mammals. The latest 5-year status review completed in 2019 recommended delisting due to extinction based on consideration of additional information about the biological status of the species, as discussed below (USFWS 2019, pp. 5, 10).

The large Kauai thrush was a medium-sized (7.9 inches, or 20 centimeters, total length) solitaire. Its plumage was gray-brown above, tinged with olive especially on the back, and light gray below with a whitish belly and undertail coverts. The large Kauai thrush lacked the white eye-ring and pinkish legs of the smaller puaiohi (small Kauai thrush) (USFWS 2006, p. 2–19). The last (unconfirmed) observation of the large Kauai thrush was made during the February 1989 Kauai Forest Bird Survey (Hawaii Department of Land and Natural Resources unpubl. data). However, the last credible sighting of the large Kauai thrush occurred in 1987.

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

The large Kauai thrush was often described for its habit of rising into the air, singing a few vigorous notes and then suddenly dropping down into the underbrush. The vocalizations of this species varied between sweet and melodic to lavish and flute-like, often given just before dawn and after dusk (USFWS 2006, p. 2–19). These behaviors indicate that detectability would be high in remaining suitable habitat if the large Kauai thrush still existed. No subsequent sightings or vocalizations have been documented despite extensive survey efforts by biologists and birders.

Survey Effort

Several recent surveys and searches, including the VCP and RBS, have been unsuccessful in detecting the large Kauai thrush despite intensive survey efforts by wildlife biologists from 1968 to 1973, and in 1981, 1989, 1993, 1994, 2000, 2005, and 2011 to 2018 (Hawaii Department of Land and Natural Resources unpubl. data; Scott et al. 1986, entire; Reynolds and Snetsinger 2001, entire; Crampton et al. 2017, entire; Crampton 2018, pers. comm.). During the RBS in 2001, coverage of the search area was extensive; therefore, they had a high probability of detecting the large Kauai thrush. None were detected, and it was concluded that the large Kauai thrush was likely extinct ($P \geq 0.95$) (Reynolds and Snetsinger 2001, p. 142).

Extensive time has been spent by qualified observers in the historical range of the large Kauai thrush searching for the small Kauai thrush, akekee, and akikiki. HFBSs were conducted in 1981, 1989, 1994, 2000, 2005, 2007, 2008, 2012, and 2018 (Paxton et al. 2016, entire; Paxton et al. 2020, entire). During the HFBS in 2012 and 2018, occupancy surveys and nest

searches did not yield any new detections of the large Kauai thrush. The KFBRP conducted mist-netting in various locations within the historical range for the large Kauai thrush from 2006 through 2009, and from 2011 through 2018, and no large Kauai thrush were caught or encountered (Crampton 2018, pers. comm.). The last credible sighting of the large Kauai thrush occurred in 1987.

Time Since Last Detection

Using 1987 as the last credible sighting of the large Kauai thrush based on independent expert opinion, the estimated date for the species' extinction was 1991, with 95 percent confidence that the species was extinct by 1999 (Elphick et al. 2010, p. 620).

III. Analysis

Several recent surveys and searches, including the RBS and HFBS, have been unsuccessful in detecting the large Kauai thrush despite intensive survey efforts by wildlife biologists in 1993, 1994, 2000, 2005, and 2011 to 2018 (Hawaii Department of Land and Natural Resources unpubl. data; Reynolds and Snetsinger 2001, entire; Crampton et al. 2017, entire; Crampton 2018, pers. comm.). Using 1987 as the last credible sighting based on independent expert opinion and the species' observational record, the estimated date for the species' extinction was 1991, with 95 percent confidence the species was extinct by 1999 (Elphick et al. 2010, p. 620). Another analysis determined that the large Kauai thrush was probably extinct at the time of the RBS in 1994 ($P \geq 0.95$) (Reynolds and Snetsinger 2001, p. 142).

IV. Conclusion

At the time of listing in 1970, the large Kauai thrush faced threats from low population numbers, habitat loss, avian disease, and predation by introduced mammals. The best available information now indicates that the large Kauai thrush is extinct. The species appears to have been vulnerable to the effects of small population size, which likely limited its genetic variation, disease resistance, and adaptive capacity, thereby increasing the vulnerability of the species to the environmental stressors of habitat degradation and predation by nonnative mammals. Since its last credible detection in 1987, qualified observers have conducted extensive surveys and searches throughout the range of the species but have not detected the species. Available information indicates that the species was not able to persist in the face of environmental stressors, and we conclude that the best available scientific and commercial information indicates that the species is extinct.

Maui Akepa (Loxops Coccineus Ochraceus)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On October 13, 1970, we listed the Maui akepa (originally listed as *Loxops ochraceus*) as endangered (35 FR 16047). This bird was included in the Maui-Molokai Forest Birds Recovery Plan (USFWS 1984, pp. 12–13), and the Revised Recovery Plan for Hawaiian Forest Birds (USFWS 2006, pp. 2–94, 2–134–2–137). At the time of listing, we considered Maui akepa to have very low population numbers, and to face threats from habitat loss, avian disease, and predation by introduced mammals. The latest 5-year status review completed in 2018 (initiated on February 12, 2016; see 81 FR 7571) recommended delisting due to extinction, based in part on continued lack of detections and consideration of extinction probability (USFWS 2018, pp. 5, 10).

The Maui akepa was known only from the island of Maui in the Hawaiian Islands. Maui akepa were found in small groups with young in the month of June when the birds were molting (Henshaw 1902, p. 62). The species appeared to also use the ohia tree for nesting, as a pair of Maui akepa was observed building a nest in the terminal foliage of a tall ohia tree (Perkins 1903, p. 420).

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

Maui akepa adult males varied from dull brownish orange to light brownish yellow, while females were duller and less yellowish (USFWS 2006, p. 2–134). Although the species was easily identifiable by sight, its small body size (less than 5 inches (13 centimeters) long) and habitat type (dense rainforest) made visual detection difficult. Songs and calls of Maui akepa could be confused with those of other Maui forest bird species; therefore, detection of the species requires visual confirmation of the individual producing the songs and calls (USFWS 2006, p. 2–135).

Survey Effort

In the absence of early historical surveys, the extent of the geographical range of the Maui akepa is unknown. Because the species occupied Maui Island, one might expect that it also inhabited Molokai and Lanai Islands like other forest birds in the Maui Nui group, but there are no fossil records of Maui akepa from either of these islands (USFWS 2006, p. 2–135). All historical records of the Maui akepa in the late 19th and early 20th centuries were from high-elevation forests most accessible to naturalists, near Olinda and Ukulele Camp on the northwest rift of Haleakala, and from mid-elevation forests in Kipahulu Valley (USFWS 2006, p. 2–134). This range suggests that the birds were missing from forests at lower elevations, perhaps due to the introduction of disease-transmitting mosquitoes to Lahaina in 1826 (USFWS 2006, p. 2–135). From 1970 to 1995, there were few credible sightings of Maui akepa (USFWS 2006, p. 2–136).

The population of Maui akepa was estimated at 230 individuals, with a 95 percent confidence interval of plus or minus 290 individuals (Scott et al. 1986, pp. 37, 154) during VCP surveys in 1980. In other words, the estimate projects a maximum population of 520 individuals and a minimum population of 0. However, confidence intervals were large, and this estimate was based on potentially confusing auditory detections, and not on visual observation (USFWS 2006, p. 2–136). On Maui, given the density of VCP survey stations, it is estimated that 5,865 point counts would be needed to determine with 95 percent confidence the absence of Maui akepa on Maui (Scott et al. 2008, p. 7). In 2008, only 84 VCP counts had been conducted on Maui in areas where this species was known to have occurred historically. Although the results of the 1980 VCP surveys find Maui akepa extant at that time, tremendous effort is required using the VCP method to confirm this species' extinction (Scott et al. 2008, pp. 6–8). For Maui akepa, nearly 70 times more VCP counts than conducted up to 2008 would be needed to confirm the species' extinction with 95 percent confidence.

Songs identified as Maui akepa were heard on October 25, 1994, during the RBS in Hanawi NAR and on November 28, 1995, from Kipahulu Valley at 6,142 feet (1,872 meters) elevation, but the species was not confirmed visually. Auditory detections of Maui akepa require visual confirmation because of possible confusion or mimicry with similar songs of Maui parrotbill (Reynolds and Snetsinger 2001, p. 140).

Qualified observers spent extensive time searching for Maui akepa, po'ouli (*Melamprosops phaeosoma*), and Maui nukupuu in the 1990s. Between September 1995 and October 1996,

1,730 acres (700 hectares) in Hanawi NAR were searched during 318 person-days (Baker 2001, p. 147), including the area with the most recent confirmed sightings of Maui akepa. During favorable weather conditions (good visibility and no wind or rain), teams would stop when ''chewee'' calls given by Maui parrotbill, or when po'ouli and Maui nukupuu were heard, and would play either Maui parrotbill or akiapolaau calls and songs to attract the bird for identification. Six po'ouli were found, but no Maui akepa were detected (Baker 2001, p. 147). The MFBRP conducted searches from 1997 through 1999 from Hanawi NAR to Koolau Gap (west of Hanawi NAR), for a total of 355 hours at three sites with no detections of Maui akepa (Vetter 2018, pers. comm.). The MFBRP also searched Kipahulu Valley on northern Haleakala from 1997 to 1999, for a total of 320 hours with no detections of Maui akepa. However, the Kipahulu searches were hampered by bad weather, and playback was not used (Vetter 2018, pers. comm.). Despite over 10,000 person-hours of searches in the Hanawi NAR and nearby areas from October 1995 through June 1999, searches failed to confirm earlier detections of Maui akepa (Pratt and Pyle 2000, p. 37). While working on Maui parrotbill recovery from 2006 to 2011, the MFBRP spent extensive time in the area of the last Maui akepa sighting. The most recent survey in 2017 across much of east and west Maui did not find Maui akepa (Judge et al. 2019, entire). The MFBRP project coordinator concluded that if Maui akepa were present, they would have been detected (Mounce 2018, pers. comm.).

Time Since Last Detection

The last confirmed sighting (as defined for the RBS) of the Maui akepa was in 1988 (Engilis 1990, p. 69). Surveys conducted during the late 1980s to the 2000s failed to locate the species (Pratt and Pyle 2000, p. 37; Baker 2001, p. 147). Using 1980 as the last documented observation record for Maui akepa (the 1988 sighting did not meet the author's criteria for a ''documented'' sighting), 1987 was estimated to be the year of extinction of Maui akepa, with 2004 as the upper 95 percent confidence bound on that estimate (Elphick et al. 2010, p. 620).

III. Analysis

Reasons for decline presumably are similar to threats faced by other endangered forest birds on Maui, including small populations, habitat degradation by feral ungulates and introduced invasive plants, and predation by introduced mammalian predators, including rats, cats (*Felis catus*), and mongoose (*Herpestes auropunctatus*) (USFWS 2006, p. 2–136). Rats may have played an especially important role as nest predators of Maui akepa. While the only nest of Maui akepa ever reported was built in tree foliage, the birds may also have selected tree cavities as does the very similar Hawaii akepa (*L. c. coccineus*). In Maui forests, nest trees are of shorter stature than where akepa survive on Hawaii Island. Suitable cavity sites on Maui are low in the vegetation, some near or at ground level, and thus are more accessible to rats. High densities of both black and Polynesian rats (*R. rattus* and *R. exulans*) are present in akepa habitat on Maui (USFWS 2006, p. 2–136).

The population of Maui akepa was estimated at 230 birds in 1980 (Scott et al. 1986, p. 154); however, confidence intervals on this estimate were large. In addition, this may have been an overestimate because it was based on audio detections that can be confused with similar songs of Maui parrotbill. The last confirmed sighting of Maui akepa was in 1988, from Hanawi NAR (Engilis 1990, p. 69). Over 10,000 search hours in Hanawi NAR and nearby areas including Kipahulu Valley from October 1995 through June 1999 failed to confirm presence of Maui akepa (Pratt and Pyle 2000, p. 37). Field presence by qualified observers from 2006 to 2011 in the area Maui akepa was last known failed to detect this species, and the MFBRP project coordinator concluded that if Maui akepa were present they would have been detected (Mounce 2018, pers. comm.). Further, using the method to determine probability of species extinction based on time (years) since the species was last observed (using 1980 as the last documented observation record, as described above), the estimated year the Maui akepa became extinct is 1987, with 2004 as the upper 95 percent confidence bound on that estimate (Elphick et al. 2010, p. 620).

IV. Conclusion

At the time of listing in 1970, we considered the Maui akepa to be facing threats from habitat loss, avian disease, and predation by introduced mammals. The best available information now indicates that the Maui akepa is extinct. The species appears to have been vulnerable to the effects of small population size, which likely limited its genetic variation, disease resistance, and adaptive capacity, thereby increasing the vulnerability of the species to the environmental stressors of habitat degradation and predation by nonnative mammals. Since the last detection in 1988, qualified observers have conducted extensive surveys in that same area with no additional detections of the species. Available information indicates that the species was not able to persist in the face of environmental stressors, and we conclude that best available scientific and commercial information indicates that the species is extinct.

Maui Nukupuu (Hemignathus Lucidus Affinis)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On October 13, 1970, we listed the Maui nukupuu (originally listed as *Hemignathus affinis*) as endangered (35 FR 16047). This bird was included in the Maui-Molokai Forest Birds Recovery Plan (USFWS 1984, pp. 8, 10–12), and the Revised Recovery Plan for Hawaiian Forest Birds (USFWS 2006, pp. 2–92–2–96). At the time of listing, we considered Maui nukupuu to have very low population numbers and to be threatened by habitat loss, avian disease, and predation by introduced mammals. The 5-year status review completed in 2018 (initiated on February 12, 2016; see 81 FR 7571) recommended delisting due to extinction (USFWS 2018, p. 11).

The Maui nukupuu was known only from the island of Maui in the Hawaiian Islands. The historical record provides little information on the life history of the Maui nukupuu (Rothschild 1893 to 1900, pp. 103–104; Perkins 1903, pp. 426–430). Nothing is known of its breeding biology, which likely was similar to its closest relative, the akiapolaau on Hawaii Island. Maui nukupuu often joined mixed-species foraging flocks (Perkins 1903, p. 429).

II. Information on Detectability, Survey Effort, and Time Since Last Detection Species Detectability

The Maui nukupuu was a medium-sized (approximately 0.78 ounce, or 23 gram) Hawaiian honeycreeper with an extraordinarily thin, curved bill that was slightly longer than the bird's head. The lower mandible was half the length of the upper mandible and followed its curvature rather than being straight (as in the related akiapolaau) (USFWS 2006, p. 2–92). Adult males were olive green with a yellow head, throat, and breast, whereas adult females and juveniles had an olive-green head and

yellow or yellowish gray under-parts. The species' coloration and bill shape were quite distinctive, making visual identification of Maui nukupuu relatively easy. The Maui nukupuu's song resembled the warble of a house finch (*Haemorhous mexicanus*) but was lower in pitch. Both the song and the ''kee-wit'' call resembled those of Maui parrotbill, and audio detection required visual confirmation (USFWS 2006, p. 2–92).

Survey Effort

Historically, the Maui nukupuu was known only from Maui, but subfossil bones of a probable Maui nukupuu from Molokai show that the species likely formerly inhabited that island (USFWS 2006, p. 2–92). All records from late 19th and early 20th centuries were from locations most accessible to naturalists, above Olinda on the northwest rift of Haleakala, and from mid-elevation forests in Kipahulu Valley (USFWS 2006, pp. 2–134). Observers at the time noted the restricted distribution and low population density of Maui nukupuu. As on Kauai, introduced mosquitoes and avian diseases may have already limited these birds to forests at higher elevations, and we can presume that the Maui nukupuu once had a much wider geographic range (USFWS 2006, pp. 2–92). In 1967, Maui nukupuu were rediscovered in the upper reaches of Kipahulu Valley on the eastern slope of Haleakala, east Maui (Banko 1968, pp. 65–66; USFWS 2006, pp. 2–95). Since then, isolated sightings have been reported on the northern and eastern slopes of Haleakala, but these reports are uncorroborated by behavioral information or follow-up sightings (USFWS 2006, pp. 2–95).

Based on a single sighting of an immature bird during VCP surveys in 1980, the population of Maui nukupuu was estimated to be 28 individuals, with a 95 percent confidence interval of plus or minus 56 individuals (Scott et al. 1986, pp. 37, 131). On Maui, given the density of VCP survey stations, it was estimated that 1,357 point counts would be needed to determine with 95 percent confidence the absence of Maui nukupuu on Maui (Scott et al. 2008, p. 7). In 2008, only 35 VCP counts had been conducted on Maui in areas where Maui nukupuu could still potentially exist. Although the results of VCP surveys in 1980 find Maui nukupuu extant at that time, a tremendous effort is required to confirm this species' extinction using VCP method (Scott et al. 2008, pp. 6–8). For Maui nukupuu, nearly 39 times more VCP counts than conducted up to 2008 would be needed to confirm this species' extinction with 95 percent confidence. The RBS reported an adult male Maui nukupuu with bright yellow plumage at 6,021 feet (1,890 meters) elevation in 1996 from Hanawi NAR (Reynolds and Snetsinger 2001, p. 140). Surveys and searches have been unsuccessful in finding Maui nukupuu since the last confirmed sighting by RBS. Based on these results, the last reliable record of Maui nukupuu was from Hanawi NAR in 1996 (24 years ago).

Qualified observers spent extensive time searching for Maui nukupuu, poʻouli, and Maui akepa in the 1990s. Between September 1995 and October 1996, 1,730 acres (700 hectares) of Hanawi NAR were searched during 318 person-days (Baker 2001, p. 147). Please refer to ''Survey Effort'' for the Maui akepa, above, for the method used in this survey. The MFBRP conducted searches from 1997 to 1999, from Hanawi NAR to Koolau Gap (west of the last sighting of Maui nukupuu) for a total of 355 hours of searches at three sites with no detections of Maui nukupuu (Vetter 2018, pers. comm.). The MFBRP also searched Kipahulu Valley on northern Haleakala from 1997 to 1999, for a total of 320 hours, with no detections of Maui nukupuu. The Kipahulu searches were hampered, however, by bad weather, and playback was not used (Vetter 2018, pers. comm.). Despite over 10,000 person-hours of searching in the Hanawi NAR and nearby areas from October 1995 through June 1999, searches failed to confirm the 1996 detection of Maui nukupuu, or produce other sightings (Pratt and Pyle 2000, p. 37). While working on Maui parrotbill recovery from 2006 to 2011, the MFBRP spent extensive time in the area of the last Maui nukupuu sighting. The most recent survey in 2017 across much of east and west Maui did not find Maui nukupuu (Judge et al. 2019, entire). The MFBRP project coordinator concluded that if Maui nukupuu were still present they would have been detected (Mounce 2018, pers. comm.).

Time Since Last Detection

The Maui nukupuu was last sighted in the Hanawi NAR in 1996 (Reynolds and Snetsinger 2001, p. 140). Surveys conducted during the late 1990s and early 2000s were unable to locate the species (Pratt and Pyle 2000, p. 37; Baker 2001, p. 147).

Elphick et al. 2010 (p. 630) attempted to apply their method to predict the probability of species extinction for the Maui nukupuu based on time (years) since the species was last observed (see ''Time Since Last Detection'' for Kauai akialoa, above). However, observations in 1967, 1980, and 1996 were not considered for this analysis because they did not meet the researchers' criteria for a confirmed sighting. Therefore, using 1896 as the last observation of Maui nukupuu, under their stringent criteria, the authors were unable to determine an estimated date for species extinction.

III. Analysis

The Maui nukupuu is also affected by small population sizes and other threats, as discussed above under ''III. Analysis'' for the Maui akepa. The population of Maui nukupuu was estimated to be 28 birds in 1980 (Scott et al. 1986, pp. 37, 131); however, confidence intervals on this estimate were large. This population was vulnerable to negative effects of small population size, including stochastic effects and genetic drift that can accelerate the decline of small populations. However, even rare species can persist despite having low numbers. The last confirmed sighting of Maui nukupuu was in 1996, from Hanawi NAR (Reynolds and Snetsinger 2001, p. 140). Over 10,000 person-search hours in Hanawi NAR and nearby areas, including Kipahulu Valley, from October 1995 through June 1999 failed to confirm this sighting or to detect other individuals (Pratt and Pyle 2000, p. 37). While working on Maui parrotbill recovery from 2006 to 2011, the MFBRP spent extensive time in the area of the last Maui nukupuu sighting; however, no Maui nukupuu were observed, and the MFBRP project coordinator concluded that if Maui nukupuu were still present they would have been detected (Mounce 2018, pers. comm.).

IV. Conclusion

At the time of listing in 1970, Maui nukupuu had very low population numbers and faced threats from habitat loss, avian disease, and predation by introduced mammals. The species appears to have been vulnerable to avian disease and the effects of small population size. The latter likely limited the species' genetic variation and adaptive capacity, thereby increasing the vulnerability of the species to the environmental stressors of habitat degradation and predation by nonnative mammals. Since its last detection in 1996, qualified observers have conducted extensive searches in the area where the species was last sighted and other native forest habitat where the species occurred historically, but they have not detected the species. Available information indicates that the species was not able to persist in the face of environmental stressors, and we conclude that the best available

scientific and commercial data indicate that the species is extinct.

Molokai Creeper (Paroreomyza Flammea)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On October 13, 1970, we listed the Molokai creeper (kākāwahie in the Hawaiian language) as endangered (35 FR 16047). This bird was included in the Maui-Molokai Forest Birds Recovery Plan (USFWS 1984, pp. 18–20) and the Revised Recovery Plan for Hawaiian Forest Birds (USFWS 2006, pp. 2–121–2–123). At the time of listing, the Molokai creeper was considered extremely rare and faced threats from habitat loss, avian disease, and predation by introduced mammals. The latest 5-year status review completed in 2018 (initiated on February 12, 2016; see 81 FR 7571) recommended delisting due to extinction based in part on continued lack of detections and consideration of extinction probability (USFWS 2018, p. 9).

The Molokai creeper was known only from Molokai in the Hawaiian Islands. Only fragmentary information is available about the life history of the species from the writings of early naturalists (Perkins 1903, pp. 413–417; Pekelo 1963, p. 64; USFWS 2006, p. 2–122). This species was an insectivore that gleaned vegetation and bark in wet ohia forests and was known almost solely from boggy areas of Molokai (Pekelo 1963, p. 64.

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

Adult males were mostly scarlet in various shades, while adult females were brown with scarlet washes and markings, and juvenile males ranged from brown to scarlet with many gradations. The bill was short and straight. Its calls were described as chip or chirping notes similar to other creeper calls (USFWS 2006, p. 2–122). Its closest relatives are the Maui creeper (*Paroreomyza montana*) and the Oahu creeper (*P. maculata*). The species' coloration and bill shape were distinctive, and Molokai creeper was identified visually with confidence.

Survey Effort

Molokai creeper was common in 1907, but by the 1930s they were considered in danger of extinction (Scott et al. 1986, p. 148). The species was last detected in 1963, on the west rim of Pelekunu Valley (Pekelo 1963, p. 64). Surveys and searches have been unsuccessful in finding the Molokai creeper since the last sighting, including VCP surveys on the Olokui Plateau in 1980 and 1988, and the RBS of the Kamakou-Pelekunu Plateau in 1995 (Reynolds and Snetsinger 2001, p. 141). Following up on a purported sighting in 2005 of a Molokai thrush (*Myadestes lanaiensis rutha*), a survey was conducted over 2 to 3 days in Puu Alii NAR, the last place the Molokai creeper was sighted in the 1960s (Pekelo 1963, p. 64; USFWS 2006, pp. 2–29). Using playback recordings for Molokai thrush, searchers covered the reserve area fairly well, but no Molokai creepers or Molokai thrush were detected (Vetter 2018, pers. comm.).

No Molokai creepers were detected during VCP surveys beginning in the late 1970s to the most recent Hawaiian forest bird survey on Molokai in 2010 (Scott et al. 1986, p. 37; Camp 2015, pers. comm.). On Molokai, given the density of VCP survey stations, it was estimated that 215,427 point counts would be needed to determine with 95 percent confidence the absence of Molokai creeper on Maui (Scott et al. 2008, p. 7). In 2008, only 131 VCP counts had been conducted on Molokai in areas where Molokai creeper could still potentially exist. For the Molokai creeper, nearly 1,650 times more VCP counts than conducted up to 2008 would be needed to confirm the species' extinction with 95 percent confidence. Based on species detection probability, the RBS determined the likelihood of the Molokai creeper being extirpated from the Kamakou-Pelekunu plateau was greater than 95 percent. Additional VCP surveys were conducted on Molokai in 2010 and 2021, but no Molokai creepers were detected (Camp 2015, pers. comm., p. 2; Berry 2021, pers. comm., p. 1). The RBS estimated the Molokai creeper to be extinct over the entirety of its range, but because not all potential suitable habitat was searched, extinction probability was not determined (Reynolds and Snetsinger 2001, p. 141).

Time Since Last Detection

The last reliable record (based on independent expert opinion and physical evidence) of Molokai creeper was from Pelekunu Valley in 1963 (Pekelo 1963, p. 64). Using 1963 as the last reliable observation record for Molokai creeper, 1969 is estimated to be year of extinction of the Molokai creeper with 1985 as the upper 95 percent confidence bound (Elphick et al. 2010, p. 620).

III. Analysis

The Molokai creeper faced similar threats to the other Maui bird species (see ''III. Analysis'' for the Maui akepa, above). The last confirmed detection of the Molokai creeper was in 1963 (Pekelo 1963, p. 64). Forest bird surveys in 1980, 1988, and 2010, and the RBS in 1994–1996 (although not including the Olokui Plateau), failed to detect this species. A 2- to 3-day search by qualified personnel for the Molokai thrush in Puu Alii NAR in 2005, the last location where Molokai creeper was sighted, also failed to detect the Molokai creeper. The estimated year of extinction is 1969, with 1985 as the 95 percent confidence upper bound (Elphick et al. 2010, p. 620). It is highly likely that avian disease, thought to be the driver of range contraction and disappearance of many Hawaiian honeycreeper species, was present periodically throughout nearly all of the Molokai creeper's range over the last half-century.

IV. Conclusion

At the time of listing in 1970, the Molokai creeper was considered to be facing threats from habitat loss, avian disease, and predation by introduced mammals. The best information now indicates that the Molokai creeper is extinct. The species appears to have been vulnerable to avian disease, as well as the effects of small population size. The latter likely limited the species' genetic variation and adaptive capacity, thereby increasing the vulnerability of the species to the environmental stressors of habitat degradation and predation by nonnative mammals. Since its last detection in 1963, qualified observers have conducted extensive searches for the Molokai creeper but have not detected the species. Available information indicates that the species was not able to persist in the face of environmental stressors, and we conclude that the best available scientific and commercial information indicates that the species is extinct.

Po'ouli (Melamprosops Phaeosoma)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On September 25, 1975, we listed the po'ouli (*Melamprosops phaeosoma*) as endangered (40 FR 44149), and the species was included in the Maui-

Molokai Forest Birds Recovery Plan (USFWS 1984, pp. 16–17) and the Revised Recovery Plan for Hawaiian Forest Birds (USFWS 2006, pp. 2–144–2–154). At the time of listing, we considered the po'ouli to have very low abundance and likely to be threatened by habitat loss, avian disease, and predation by introduced mammals. The latest 5-year status review completed in 2018 (initiated on February 12, 2016; see 81 FR 7571) recommended delisting due to extinction, based in part on continued lack of detections and consideration of extinction probability (USFWS 2018, pp. 4–5, 10).

The po'ouli was known only from the island of Maui in the Hawaiian Islands and was first discovered in 1973, in high-elevation rainforest on the east slope of Haleakala (USFWS 2006, p. 2–146). Fossil evidence shows that the po'ouli once inhabited drier forests at lower elevation on the leeward slope of Haleakala, indicating it once had a much broader geographic and habitat range (USFWS 2006, p. 2–147). Po'ouli were observed singly, in pairs, and in family groups consisting of both parents and a single offspring (Pratt et al. 1997, p. 1). Po'ouli foraged primarily on tree branches, making extensive use of the subcanopy and understory. They seemed to have preferred the native hydrangea (kanawao [*Broussaisia arguta*]), the native holly (kawau [*Ilex anomala*]), and ohia (Pratt et al. 1997, p. 4). Po'ouli were unusually quiet. Males rarely sang and did so mostly as part of courtship prior to egg-laying. The maximum lifespan of this species is estimated to be 9 years (The Animal Aging and Longevity Database 2020, unpaginated).

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

The po'ouli was a medium-sized, 0.9 ounce (26 gram), stocky Hawaiian honeycreeper, easily recognized by its brown plumage and characteristic black mask framed by a gray crown and white cheek patch. However, po'ouli were unusually quiet. Although distinctive visually, because the species rarely vocalized, it was difficult to survey by audio detections.

Survey Effort

The po'ouli was first discovered in 1973 (USFWS 2006, p. 2–146). Total population was estimated at 140 individuals, with a 95 percent confidence interval of plus or minus 280 individuals, during VCP surveys in 1980 (Scott et al. 1986, pp. 37, 183), but estimates of population size and density were likely inaccurate and considered imprecise due to the species' low density and cryptic behavior (USFWS 2006, p. 2–147). In 1994, after nearly 2 years without a sighting, the continued existence and successful breeding of five to six po'ouli in the Kuhiwa drainage of Hanawi NAR was confirmed (Reynolds and Snetsinger 2001, p. 141). Thorough surveys of the historical range between 1997 and 2000, the MFBRP located only three birds, all in separate territories in Hanawi NAR. These three po'ouli were color-banded in 1996 and 1997, and subsequently observed (see below), but no other individuals have been observed since then (Baker 2001, p. 144; USFWS 2006, pp. 2–147–2–148). The MFBRP searched Kipahulu Valley on northern Haleakala from 1997 to 2000, for a total of 320 hours, but failed to detect po'ouli. These searches were hampered by bad weather, however, and playback was not used (Vetter 2018, pers. comm.). The most recent survey in 2017 across much of east and west Maui did not find po'ouli (Judge et al. 2019, entire).

Time Since Last Detection

In 2002, what was thought to be the only female po'ouli of the three in Hanawi NAR was captured and released into one of the male's territories, but she returned to her home range the following day (USFWS 2006, p. 2–151). In 2004, an effort was initiated to capture the three remaining po'ouli to breed them in captivity. One individual was captured and successfully maintained in captivity for 78 days, but died on November 26, 2004, before a potential mate could be obtained. The remaining two birds were last seen in December 2003 and January 2004 (USFWS 2006, pp. 2–153–2–154). While working on Maui parrotbill recovery from 2006 to 2011, the MFBRP spent extensive time in the area of the last po'ouli sightings. No po'ouli were seen or heard. The MFBRP project coordinator concluded that if po'ouli were present, they would have been detected (Mounce 2018, pers. comm.).

Using 2004 as the last reliable observation record for po'ouli, 2005 is estimated to be the year of extinction, with 2008 as the upper 95 percent confidence bound on that estimate (Elphick et al. 2010, p. 620).

III. Analysis

The po'ouli faced threats similar to other bird species occurring on Maui (see ''III. Analysis'' for the Maui akepa, above). The last confirmed sighting of po'ouli was in 2004 from Hanawi NAR (USFWS 2006, p. 2–154). Extensive field presence by qualified individuals from 2006 to 2011 in Hanawi NAR, where po'ouli was last observed, failed to detect this species, as did searches of Kipahulu Valley near Hanawi NAR from 1997 to 1999 (USFWS 2006, p. 2–94). Using 2004 as the last reliable observation record for po'ouli, the estimated year the species went extinct is 2005, with 2008 the upper 95 percent confidence bound on that estimate (Elphick et al. 2010, p. 620).

IV. Conclusion

At the time of its listing in 1975, we considered po'ouli to have very low population abundance, and to face threats from habitat loss, avian disease, and predation by introduced mammals. The best available information now indicates that the po'ouli is extinct. Although the po'ouli was last detected as recently as early 2004, the species appears to have been vulnerable to the effects of small population size since it was first discovered in 1973. The small population size likely limited its genetic variation, disease resistance, and adaptive capacity over time, thereby increasing the vulnerability of the species to the environmental stressors of habitat degradation and predation by nonnative mammals. Experienced staff with MFBRP conducted extensive recovery work in po'ouli habitat between 2006 and 2011, and had no detections of the species. Available information indicates that the species was not able to persist in the face of environmental stressors, and we conclude that the species is extinct.

Fishes

San Marcos Gambusia (Gambusia Georgei)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On July 14, 1980, we listed the San Marcos gambusia, a small fish, as endangered (45 FR 47355). We concurrently designated approximately 0.5 miles of the San Marcos River as critical habitat for the species (45 FR 47355, July 14, 1980, p. 47364). The San Marcos gambusia was endemic to the San Marcos River in San Marcos, Texas. The San Marcos gambusia has historically only been found in a section of the upper San Marcos River approximately from Rio Vista Dam to a point near the U.S. Geological Survey gaging station immediately downstream from Thompson's Island. Only a limited number of species of *Gambusia* are

native to the United States; of this subset, the San Marcos gambusia had one of the most restricted ranges.

We listed the species as endangered due to decline in population size, low population numbers, and possibility of lowered water tables, pollution, bottom plowing (a farming method that brings subsoil to the top and buries the previous top layer), and cutting of vegetation (43 FR 30316; July 14, 1978). We identified groundwater depletion, reduced spring flows, contamination, habitat impacts resulting from severe drought conditions, and cumulative effects of human activities as threats to the species (43 FR 30316; July 14, 1978). At the time of listing, this species was extremely rare.

There has also been evidence of hybridization between *G. georgei* and *G. affinis* (western mosquitofish) in the wild. Hybridization between *G. georgei* and *G. affinis* continued for many years without documented transfer of genes between the species that would have resulted in the establishment of a new species (Hubbs and Peden 1969, p. 357). Based on collections in the 1920s, a study in the late 1960s surmised that limited hybridization with *G. affinis* did not seem to have reduced the specific integrity of either species. However, as fewer *G. georgei* individuals existed in the wild and therefore encountered each other, the chances of hybridization with the much more common *G. affinis* increased.

On May 31, 2018, we initiated a 5-year review of the species (83 FR 25034). The review relied on available information, including survey results, fish collection records, peer-reviewed literature, various agency records, and correspondences with leading *Gambusia* species experts in Texas. That 5-year review recommended delisting the San Marcos gambusia due to extinction.

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

Historically, the San Marcos gambusia had small populations, and the pattern of abundance strongly suggests a decrease beginning prior to the mid-1970s. Historical records indicate that San Marcos gambusia was likely collected from the headwaters of the San Marcos River (Hubbs and Peden 1969, p. 28). The highest number of San Marcos gambusia ever collected was 119 in 1968. Because this species preferred sections of slow-moving waters and had a limited historical range of a small section of the San Marcos River, potential detection was not expected to be difficult.

Survey Effort

In 1976, we contracted a status survey to improve our understanding of the species and its habitat needs. We facilitated bringing individuals into captivity for breeding and study. Many researchers have been involved and have devoted considerable effort to attempts to locate and preserve populations. Intensive collections during 1978 and 1979 yielded only 18 San Marcos gambusia from 20,199 *Gambusia* total, which means San Marcos gambusia amounted to only 0.09 percent of those collections (Edwards et al. 1980, p. 20). Captive populations were established at the University of Texas at Austin in 1979, and fish from that captive population were used to establish a captive population at our Dexter National Fish Hatchery in 1980. Both captive populations later became contaminated with another *Gambusia* species. The fish hybridized, and the pure stocks were lost.

Following the failed attempt at maintaining captive populations at Dexter National Fish Hatchery and the subsequent listing of the species in 1980, we contracted for research to examine known localities and collect fish to establish captive refugia. Collections made in 1981 and 1982 within the range of San Marcos gambusia indicated a slight decrease in relative abundance of this species (0.06 percent of all *Gambusia*). From 1981 to 1984, efforts were made to relocate populations and reestablish a culture of individuals for captive refugia. Too few pure San Marcos gambusia and hybrids were found to establish a culture, although attempts were made with the few fish available (Edwards et al. 1980, p. 24). In the mid-1980s, staff from the San Marcos National Fish Hatchery and Technology Center also searched unsuccessfully for the species in attempts to locate individuals to bring into captivity.

Intensive searches for San Marcos gambusia were conducted in May, July, and September of 1990, but were unsuccessful in locating any pure San Marcos gambusia. The searches consisted of more than 180 people-hours of effort over the course of 3 separate days and covered the area from the headwaters at Spring Lake to the San Marcos wastewater treatment plant outfall. Over 15,450 *Gambusia* were identified during the searches. One individual collected during the search was visually identified as a possible backcross of *G. georgei* and *G. affinis* (Service 1990 permit report). This individual was an immature fish with plain coloration. Additional sampling near the Interstate Highway 35 type locality has occurred at approximately yearly intervals since 1990, and no San Marcos gambusia have been found. No San Marcos gambusia were found in the 32,811 *Gambusia* collected in the upper San Marcos River by the Service from 1994 to 1996 (Edwards 1999, pp. 6–13).

Time Since Last Detection

Academic researchers, Texas Parks and Wildlife Department scientists, and the Service have continued to search for the San Marcos gambusia during all collection and research with fishes on the San Marcos River. San Marcos gambusia have not been found in the wild since 1983, even with intensive searches, including the ones conducted in May, July, and September of 1990, covering the species' known range and designated critical habitat. Since 1996, all attempts to locate and collect San Marcos gambusia have failed (Edwards 1999, p. 3; Edwards et al. 2002, p. 358; Hendrickson and Cohen 2015, unpaginated; Bio-West 2016, p. 43; Bonner 2018, pers. comm.). More recent surveys and analyses of fish species already consider the San Marcos gambusia extinct (Edwards et al. 2002, p. 358; Hubbs et al. 2008, p. 3). Additionally, hybridized individuals have not been documented since 1990.

III. Analysis

Although the population of San Marcos gambusia was historically small, it also had one of the most restricted ranges of *Gambusia* species. San Marcos gambusia have not been found in the wild since 1983, even with intensive searches, including the ones conducted in May, July, and September of 1990, covering the species' known range and designated critical habitat. Additionally, no detections of hybridized San Marcos gambusia with *G. affinis* is further evidence that extinction has occurred.

In addition to the San Marcos gambusia not being found in the wild, all attempts at captive breeding have failed. This is largely due to unsuccessful searches for the species in attempts to locate individuals to bring into captivity.

Due to the narrow habitat preference and limited range of the San Marcos gambusia, and the exhaustive survey and collection efforts that have failed to detect the species, we conclude there is a very low possibility of an individual or population remaining extant but undetected. Therefore, the decrease in San Marcos gambusia abundance, and the lack of hybridized individuals in

any recent samples, indicates that the species is extinct.

IV. Conclusion

The San Marcos gambusia was federally listed as endangered in 1980. At the time of listing, this species was rare. The last known collections of San Marcos gambusia from the wild were in the early 1980s (Edwards 1999, p. 2; Edwards 2002, p. 358), and the last known sighting in the wild occurred in 1983. In 1985, after unsuccessful breeding attempts with *G. affinis* from the upper San Marcos River, the last captive female San Marcos gambusia died. All available information and field survey data support a determination that the San Marcos gambusia has been extinct in the wild for more than 35 years. We have reviewed the best scientific and commercial data available to conclude that the species is extinct.

Scioto Madtom (Noturus Trautmani)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On September 25, 1975, we listed the Scioto madtom (*Noturus trautmani*) as endangered (40 FR 44149), due to the pollution and siltation of its habitat and the proposal to construct two impoundments within its range. Two 5-year reviews were initiated in 2009 (74 FR 11600; March 18, 2009) and 2014 (79 FR 38560; July 8, 2014). The recommendations from both the 2009 and 2014 reviews were to delist the species due to extinction (Service 2009, p. 7; Service 2014, p. 6).

The Scioto madtom was a small, nocturnal species of catfish in the family Ictaluridae. The Scioto madtom has been found only in a small section of Big Darby Creek, a major tributary to the Scioto River, and was believed to be endemic to the Scioto River basin in central Ohio (40 FR 44149, September 25, 1975; Service 1985, p. 10; Service 1988, p. 1).

The species was first collected in 1943 (Trautman 1981, p. 504), and was first described as a species in 1969 (Taylor 1969, pp. 156–160). Only 18 individuals of the Scioto madtom were ever collected. All were found along one stretch of Big Darby Creek, and all but one were found within the same riffle known as Trautman's riffle. The riffle habitat was comprised of glacial cobble, gravel, sand, and silt substrate, with some large boulders (Trautman 1981, p. 505) with moderate current and high-quality water free of suspended sediments.

The exact cause of the Scioto madtom's decline is unknown, but was likely due to modification of its habitat from siltation, suspended industrial effluents, and agricultural runoff (40 FR 44149, September 25, 1975; Service 1988, p. 2). At the time of listing, two dams were proposed for Big Darby Creek, although ultimately they were never constructed. It should also be noted that the northern madtom (*N. stigmosus*) was first observed in Big Darby Creek in 1957, the same year the last Scioto madtom was collected (Service 1982, p. 3; Kibbey 2009, pers. comm.). Given the apparent small population size and highly restricted range of the Scioto madtom in the 1940s and 1950s, it is possible that the species was unable to successfully compete with the northern madtom for the same food and shelter resources (Kibbey 2009, pers. comm.).

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

The Scioto madtom looked similar to other madtom species but could be distinguished by characteristics such as the number of pectoral and anal rays (Taylor 1969, p. 156). The species, like other madtom species, was relatively cryptic as they hid during the daylight hours under rocks or in vegetation and emerged after dark to forage along the bottom of the stream (Tetzloff 2003, p. 1). Despite these detection challenges, many surveys by experienced biologists have been undertaken to try to locate extant populations of Scioto madtom (USFWS 1977, entire; USFWS 1982, entire; USFWS 1985, entire; USFWS 1997, entire; Kibbey 2009, pers. comm.).

Survey Effort

No Scioto madtoms have been observed since 1957, despite intensive fish surveys throughout Big Darby Creek in 1976–1977 (Service 1977, p. 15), 1981–1985 (Service 1982, p. 1; Service 1985, p. 1), 2014–2015 (Ohio Environmental Protection Agency (OEPA) 2018, p. 48), and 2001–2019 (Kibbey 2009, pers. comm.; Zimmerman 2014, 2020, pers. comm.).

The fish surveys conducted in Big Darby Creek in 1976–1977 and 1981–1985 specifically targeted the Scioto madtom. The 1976–1977 survey found 41 madtoms of 3 species and 34 species of fish in riffles at and near the Scioto madtom type locality (Service 1977, pp. 13–15). The 1981–1985 survey occurred throughout Big Darby Creek and found a total of 2,417 madtoms of 5 species (Service 1985, pp. 1, 5, 19–23). Twenty-two percent (542 individuals) of the total madtoms were riffle madtoms of the subgenus Rabida, which also includes the Scioto madtom (Service 1985, p. 1). None of the species identified were the Scioto madtom.

The 2014–2015 fish surveys occurred throughout the Big Darby Creek watershed as part of the Ohio Environmental Protection Agency's (OEPA's) water-quality monitoring program. A total of 96,471 fish representing 85 different species and 6 hybrids, were collected at 93 sampling locations throughout the Big Darby Creek study area during the 2014 sampling season. Fish surveys were conducted at numerous sites in Big Darby Creek between 2001 and 2019, using a variety of survey techniques, including seining, boat electrofishing, backpack electrofishing, and dip netting (Zimmerman 2020, pers. comm.). Another survey was also conducted annually in the Big Darby Creek from 1970 to 2005 (Cavender 1999, pers. comm.; Kibbey 2016, pers. comm.).

These surveys also included extensive searches for populations of Scioto madtoms outside of the type locality in Big Darby Creek (Kibbey 2016, pers. comm.). In addition to fish surveys in the Big Darby Creek watershed, the OEPA has conducted a number of fish studies throughout the Upper, Middle, and Lower Scioto River watershed as part of the agency's Statewide Water Quality Monitoring Program (OEPA 1993a, 1993b, 1999, 2002, 2004, 2006, 2008, 2012, 2019, entire). These surveys have never detected a Scioto madtom.

Time Since Last Detection

No collections of the Scioto madtom have been made since 1957. Given that the extensive fish surveys conducted since 1970 within the species' historical location, as well as along the entire length of Big Darby Creek and in the greater Scioto River watershed, have recorded three other species of madtom but not the Scioto madtom, it is highly unlikely that the Scioto madtom has persisted without detection.

Other Considerations Applicable to the Species' Status

The habitat that once supported the Scioto madtom has been drastically altered, primarily via strong episodic flooding. Although periodic flooding has historically been a part of Big Darby Creek's hydrological regime, many of the original riffles where Scioto madtoms were collected from just downstream of the U.S. Route 104 Bridge to approximately one-half mile upstream have been washed out to the

point where they are nearly gone (Kibbey 2009, pers. comm.). Furthermore, pollution sources throughout the Scioto River watershed, including row crop agriculture, development, and urban runoff, have reduced the water quality and suitability of habitat for madtoms (OEPA 2012, pp. 1–2).

III. Analysis

There has been no evidence of the continued existence of the Scioto madtom since 1957. Surveys for the species were conducted annually between 1970 and 2005, at the only known location for the species. Additional surveys in the Big Darby Creek watershed have never found other locations of Scioto madtom. After decades of survey work with no individuals being detected, it is extremely unlikely that the species is extant. Further, available habitat for the species in the only location where it has been documented is now much reduced, which supports the conclusion that the species is likely extinct.

IV. Conclusion

We conclude that the Scioto madtom is extinct and, therefore, should be delisted. This conclusion is based on a lack of detections during numerous surveys conducted for the species and significant alteration of habitat at its known historical location.

Mussels

Flat Pigtoe (Pleurobema Marshalli)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On April 7, 1987, we listed the flat pigtoe (formerly known as Marshall's mussel), as endangered, primarily due to habitat alteration from a free-flowing riverine system to an impounded system (52 FR 11162). Two 5-year reviews were completed in 2009 (initiated on September 8, 2006; see 71 FR 53127) and 2015 (initiated on March 25, 2014; see 79 FR 16366); both recommended delisting the flat pigtoe due to extinction. The Service solicited peer review from six experts for both 5-year reviews from State, Federal, university, and museum biologists with known expertise and interest in Mobile River Basin mussels (USFWS 2009, pp. 23–24; USFWS 2015, pp. 15–16); we received responses from three of the peer reviewers, and they concurred with the content and conclusion that the species is extinct.

The flat pigtoe was described in 1927, from specimens collected in the Tombigbee River (USFWS 1989, p. 2). The shell of the flat pigtoe had pustules or welts on the postventral surface, and the adults were subovate in shape and approximately 2.4 inches long and 2 inches wide (USFWS 1989, p. 2). Freshwater mussels of the Mobile River Basin, such as the flat pigtoe, are most often found in clean, fast-flowing water in stable sand, gravel, and cobble/gravel substrates that are free of silt (USFWS 2000, p. 81). They are typically found buried in the substrate in shoals and runs (USFWS 2000, p. 81). This type of habitat has been nearly eliminated within the historical range of the species because of the construction of the Tennessee-Tombigbee Waterway in 1984, which created a dredged, straightened navigation channel and a series of impoundments that inundated nearly all riverine mussel habitat (USFWS 1989, p. 1).

The flat pigtoe was historically known from the Tombigbee River from just above Tibbee Creek near Columbus, Mississippi, downstream to Epes, Alabama (USFWS 1989, p. 3). Surveys in historical habitat over the past three decades have failed to locate the species, and all historical habitat is impounded or modified by channelization and impoundments (USFWS 2015, p. 5). No live or freshly dead shells have been observed since the species was listed in 1987 (USFWS 2009, p. 4; USFWS 2015, p. 5).

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

Detection of rare, cryptic, benthic-dwelling animals like freshwater mussels is challenging and can be affected by a variety of factors, including:

- Size of the mussel (smaller mussels, including juvenile mussels, can be more difficult to find in complex substrates than larger mussels, and survey efforts must be thorough enough to try to detect smaller mussels);
- Behavior of the mussel (some are found subsurface, some at the surface, and some above the surface, and position can vary seasonally [some are more visible during the reproductive phase when they need to come into contact with host fish; therefore, surveys likely need to be conducted during different times of the year to improve detection]);
- Substrate composition (it can be easier to see/feel mussels in sand and clay than in gravel or cobble; therefore, surveys need to include all substrate types because mussels can fall off host fish into a variety of substrates);
- Size of river (larger rivers usually have more expansive habitat areas to search and are sometimes deep, requiring specialized survey techniques such as self-contained underwater breathing apparatus [SCUBA]);
- Flow conditions (visibility can be affected in very fast-flowing, very shallow, or turbid conditions; therefore, surveys need to use tactile or excavation methods, or delay until turbidity conditions improve);
- Surveyor experience (finding mussels requires a well-developed search image, knowledge of instream habitat dynamics, and ability to identify and distinguish species); and
- Survey methodology and effort (excavation and sifting of stream bottom can detect more mussels than visual or tactile surveys).

All of these challenges are taken into account when developing survey protocols for any species of freshwater mussel, including the flat pigtoe. The flat pigtoe was medium-sized (but juveniles were very small) and most often found buried in sand, gravel, or cobble in fast-flowing runs. However, mussels can be found in suboptimal conditions, depending on where they dropped off of the host fish. Therefore, all of the above-mentioned considerations need to be accounted for when trying to detect this mussel species. Despite detection challenges, many well-planned, comprehensive surveys by experienced State and Federal biologists have been carried out, and those surveys have not been able to locate extant populations of flat pigtoe in the Tombigbee River (USFWS 2000, p. 81; USFWS 2015, p. 5).

Survey Effort

Prior to listing, freshly dead shells of flat pigtoe were collected in 1980, from the Tombigbee River, Lowndes County, Mississippi (USFWS 2009, pp. 4–5), and a 1984 survey of the Gainesville Bendway of Tombigbee River also found shells of the flat pigtoe (USFWS 1989, p. 4). After listing in 1987, surveys in 1988 and 1990 only found weathered, relict shells of the flat pigtoe below Heflin Dam, thus casting doubt on the continued existence of the species in the Gainesville Bendway (USFWS 1989, p. 4; USFWS 2009, p. 5). Over the past three decades, surveys between 1990–2001, and in 2002, 2003, 2009, 2011, and 2015, of potential habitat throughout the historical range, including intensive surveys of the Gainesville Bendway, where adequate

habitat and flows may still occur below the Gainesville Dam on the Tombigbee River in Alabama, have failed to find any live or dead flat pigtoes (USFWS 2000, p. 81).

Time Since Last Detection

The flat pigtoe has not been collected alive since completion of the Tennessee-Tombigbee Waterway in 1984 (USFWS 2000, p. 81; USFWS 2015, p. 5). Mussel surveys within the Tombigbee River drainage during 1984–2015 failed to document the presence of the flat pigtoe (USFWS 2015, p. 8).

Other Considerations Applicable to the Species' Status

Habitat modification is the major cause of decline of the flat pigtoe (USFWS 2000, p. 81). Construction of the Tennessee-Tombigbee Waterway for navigation adversely impacted mussels and their habitat by physical destruction during dredging, increasing sedimentation, reducing water flow, and suffocating juveniles with sediment (USFWS 1989, p. 6). Other threats include channel improvements such as clearing and snagging, as well as sand and gravel mining, diversion of flood flows, and water removal for municipal use. These activities impact mussels by altering the river substrate, increasing sedimentation, changing water flows, and killing individuals via dredging and snagging (USFWS 1989, pp. 6–7). Runoff from fertilizers and pesticides results in algal blooms and excessive growth of other aquatic vegetation, resulting in eutrophication and death of mussels due to lack of oxygen (USFWS 1989, p. 7). The cumulative impacts of habitat degradation due to these factors likely led to flat pigtoe populations becoming scattered and isolated over time. Low population levels increased the difficulty of successful reproduction (USFWS 1989, p. 7). When individuals become scattered, the opportunity for egg fertilization is diminished. Coupled with habitat changes that result in reduced host fish interactions, the spiral of failed reproduction leads to local extirpation and eventual extinction of the species (USFWS 1989, p. 7).

III. Analysis

There has been no evidence of the continued existence of the flat pigtoe for more than three decades. Mussel surveys within the Tombigbee River drainage from 1984–2015 have failed to document the presence of the species (USFWS 2015, p. 8). All known historical habitat has been altered or degraded by impoundments, and the species is presumed extinct by most authorities.

IV. Conclusion

We conclude that the flat pigtoe is extinct and, therefore, should be delisted. This conclusion is based on significant alteration of all known historical habitat and lack of detections during numerous surveys conducted throughout the species' range.

Southern Acornshell (Epioblasma Othcaloogensis)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On March 17, 1993, we listed the southern acornshell as endangered, primarily due to habitat modification, sedimentation, and water-quality degradation (58 FR 14330). We designated critical habitat on July 1, 2004 (69 FR 40084). Two 5-year reviews were completed in 2008 (initiated on June 14, 2005; see 70 FR 34492) and 2018 (initiated on September 23, 2014; see 79 FR 56821), both recommending delisting the southern acornshell due to extinction. We solicited peer review from eight experts for both 5-year reviews from State, Federal, university, nongovernmental, and museum biologists with known expertise and interest in Mobile River Basin mussels (Service 2008, pp. 36–37; Service 2018, p. 15); we received responses from five of the peer reviewers, who all concurred with the content and conclusion that the species is extinct.

The southern acornshell was described in 1857 from Othcalooga Creek in Gordon County, Georgia (58 FR 14330 at 14331, March 17, 1993). Adult southern acornshells were round to oval in shape and approximately 1.2 inches in length (Service 2000, p. 57). *Epioblasma othcaloogensis* was included as a synonym of *E. penita* and was considered to be an ectomorph of the latter (58 FR 14330 at 14331, March 17, 1993). The Service recognizes *Unio othcaloogensis* (Lea) and *U. modicellus* (Lea) as synonyms of *Epioblasma othcaloogensis.*

The southern acornshell was historically found in shoals in small rivers to small streams in the Coosa and Cahaba River systems (Service 2000, p. 57). As with many of the freshwater mussels in the Mobile River Basin, it was found in stable sand, gravel, cobble substrate in moderate to swift currents. The species had a sexual reproduction strategy and required a host fish to complete the life cycle. Historically, the species occurred in upper Coosa River tributaries and the Cahaba River in Alabama, Georgia, and Tennessee (Service 2000, p. 57). In the upper Coosa River system, the southern acornshell occurred in the Conasauga River, Cowan's Creek, and Othcalooga Creek (58 FR 14330 at 14331, March 17, 1993). At the time of listing in 1993, the species was estimated to persist in low numbers in streams in the upper Coosa River drainage in Alabama and Georgia, and possibly in the Cahaba River (58 FR 14330 at 14331, March 17, 1993; Service 2018, p. 6). The southern acornshell was last collected in 1973, from the Conasauga River in Georgia and from Little Canoe Creek, near the Etowah and St. Clair County line, Alabama. It has not been collected from the Cahaba River since the 1930s (Service 2018, p. 5).

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

Detection of rare, cryptic, benthic-dwelling animals like freshwater mussels is challenging and can be affected by a variety of factors. Please refer to ''Species Detectability'' for the flat pigtoe, above, for the descriptions of these factors. The southern acornshell was small-sized (with very small juveniles) and most often found buried in sand, gravel, or cobble in fast flowing runs. However, mussels can be found in sub-optimal conditions, depending on where they dropped off of the host fish. Therefore, all of the detection considerations need to be accounted for when trying to detect this mussel species. Despite detection challenges, many well-planned, comprehensive surveys by experienced State and Federal biologists have been carried out, and those surveys have not been able to locate extant populations of southern acornshell (Service 2000, p. 57; Service 2008, p. 20; Service 2018, p. 7).

Survey Effort

Prior to listing, southern acornshell was observed during surveys in the upper Coosa River drainage in Alabama and Georgia in 1966–1968 and in 1971–1973, by Hurd (58 FR 14330 at 14331, March 17, 1993). Records of the species in the Cahaba River are from surveys at Lily Shoals in Bibb County, Alabama, in 1938, and from Buck Creek (Cahaba River tributary), Shelby County, Alabama, in the early 1900s (58 FR 14330 at 14331, March 17, 1993). Both the 2008 and 2018 5-year reviews reference multiple surveys by experienced Federal, State, and private biologists—17 survey reports from 1993–2006 and 6 survey reports from 2008–2017—and despite these repeated

surveys of historical habitat in both the Coosa and Cahaba River drainages, no living animals or fresh or weathered shells of the southern acornshell have been located (Service 2008, p. 19; Service 2018, p. 6).

Time Since Last Detection

The most recent records for the southern acornshell were from tributaries of the Coosa River in 1966–1968 and 1974, and the Cahaba River in 1938 (58 FR 14330 at 14331, March 17, 1993; Service 2008, p. 19; Service 2018, p. 5). No living populations of the southern acornshell have been located since the 1970s (Service 2000, p. 57; Service 2008, p. 20; Service 2018, p. 7).

Other Considerations Applicable to the Species' Status

Habitat modification was the major cause of decline of the southern acornshell (Service 2000, p. 57). Other threats included channel improvements such as clearing and snagging, as well as sand and gravel mining, diversion of flood flows, and water removal for municipal use; these activities impacted mussels by alteration of the river substrate, increasing sedimentation, alteration of water flows, and direct mortality from dredging and snagging (Service 2000, pp. 6–13). Runoff from fertilizers and pesticides results in algal blooms and excessive growth of other aquatic vegetation, resulting in eutrophication and death of mussels due to lack of oxygen (Service 2000, p.13). The cumulative impacts of habitat degradation likely led to southern acornshell populations becoming scattered and isolated over time. Low population levels mean increased difficulty for successful reproduction (Service 2000, p.14). When individuals become scattered, the opportunity for a female southern acornshell to successfully fertilize eggs is diminished, and the spiral of failed reproduction leads to local extirpation and eventual extinction of the species (Service 2000, p. 14).

III. Analysis

There has been no evidence of the continued existence of the southern acornshell for over five decades; the last known specimens were collected in the early 1970s. When listed in 1993, it was thought that the southern acornshell was likely to persist in low numbers in the upper Coosa River drainage and, possibly, in the Cahaba River. Numerous mussel surveys have been completed within these areas, as well as other areas within the historical range of the species since the listing, with no success. Although other federally listed mussels have been found by mussel experts during these surveys, no live or freshly dead specimens of the southern acornshell have been found (Service 2018, p. 7). The species is extinct.

IV. Conclusion

We conclude that the southern acornshell is extinct and, therefore, should be delisted. This conclusion is based on significant alteration of known historical habitat and lack of detections during numerous surveys conducted throughout the species' range.

Stirrupshell (Quadrula Stapes)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On April 7, 1987, we listed the stirrupshell as endangered, primarily due to habitat alteration from a free-flowing riverine system to an impounded system (52 FR 11162). Two 5-year reviews were completed in 2009 (initiated on September 8, 2006; see 71 FR 53127) and 2015 (initiated on March 25, 2014; see 79 FR 16366); both recommended delisting the stirrupshell due to extinction. We solicited peer review from six experts for both 5-year reviews from State, Federal, university, and museum biologists with known expertise and interest in Mobile River Basin mussels (Service 2009, pp. 23–24; Service 2015, pp. 15–16); we received responses from three of the peer reviewers, and they concurred with the content and conclusion that the species is extinct.

The stirrupshell was described as *Unio stapes* in 1831, from the Alabama River (Stansbery 1981, entire). Other synonyms are *Margarita* (*Unio*) *stapes* in 1836, *Margaron* (*Unio*) *stapes* in 1852, *Quadrula stapes* in 1900, and *Orthonymus stapes* in 1969 (Service 1989, pp. 2–3). Adult stirrupshells were quadrate in shape and reached a size of approximately 2 inches long and 2 inches wide. The stirrupshell differed from other closely related species by the presence of a sharp posterior ridge and truncated narrow rounded point posteriorly on its shell, and it had a tubercled posterior surface (Service 1989, p. 3; Service 2000, p. 85). Freshwater mussels of the Mobile River Basin, such as the stirrupshell, are most often found in clean, fast-flowing water in stable sand, gravel, and cobble gravel substrates that are free of silt (Service 2000, p. 85). They are typically found buried in the substrate in runs (Service 2000, p. 85). This type of habitat has been nearly eliminated in the Tombigbee River because of the construction of the Tennessee-Tombigbee Waterway, which created a dredged, straightened navigation channel and series of impoundments that inundated much of the riverine mussel habitat (Service 1989, p. 1).

The stirrupshell was historically found in the Tombigbee River from Columbus, Mississippi, downstream to Epes, Alabama; the Sipsey River, a tributary to the Tombigbee River in Alabama; the Black Warrior River in Alabama; and the Alabama River (Service 1989, p. 3). Surveys in historical habitat over the past three decades have failed to locate the species, as all historical habitat is impounded or modified by channelization and impoundments (Tombigbee and Alabama Rivers) or impacted by sediment and nonpoint pollution (Sipsey and Black Warrior Rivers) (Service 1989, p. 6; Service 2000, p. 85; Service 2015, p. 5). No live or freshly dead shells have been observed since the species was listed in 1987 (Service 2009, p. 6; Service 2015, p. 7). A freshly dead shell was last collected from the lower Sipsey River in 1986 (Service 2000, p. 85).

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

Detection of rare, cryptic, benthic-dwelling animals like freshwater mussels is challenging, and can be affected by a variety of factors. Please refer to ''Species Detectability'' for the flat pigtoe, above, for the descriptions of these factors. The stirrupshell was medium-sized (with very small juveniles) and most often found buried in sand, gravel, or cobble in fast flowing runs. However, mussels can be found in sub-optimal conditions, depending on where they dropped off of the host fish. Therefore, all of the detection considerations need to be accounted for when trying to detect this mussel species. Despite detection challenges, many well-planned, comprehensive surveys by experienced State and Federal biologists have been carried out, and those surveys have not been able to locate extant populations of stirrupshell (Service 1989, pp. 3–4; Service 2000, p. 85; Service 2015, pp. 7–8).

Survey Effort

Prior to listing in 1987, stirrupshell was collected in 1978, from the Sipsey River, and a 1984 and 1986 survey of the Sipsey River found freshly dead shells; a 1984 survey of the Gainsesville Bendway of Tombigbee River found

freshly dead shells of the stirrupshell (Service 1989, p. 4; Service 2000, p. 85). After listing, surveys in 1988 and 1990 only found weathered, relict shells of the stirrupshell from the Tombigbee River at the Gainesville Bendway and below Heflin Dam, which cast doubt on the continued existence of the species in the mainstem Tombigbee River (Service 1989, p. 4; Service 2009, p. 6). Over the past three decades, repeated surveys (circa 1988, 1998, 2001, 2002, 2003, 2006, 2011) of unimpounded habitat in the Sipsey and Tombigbee Rivers, including intensive surveys of the Gainesville Bendway, have failed to find any evidence of stirrupshell (Service 2009, p. 6; Service 2015, p. 7).

The stirrupshell was also known from the Alabama River; however, over 92 hours of dive bottom time were expended searching appropriate habitats for imperiled mussel species between 1997–2007 without encountering the species (Service 2009, p. 6), and a survey of the Alabama River in 2011 also did not find stirrupshell (Service 2015, p. 5). Surveys of the Black Warrior River in 1993 and from 2009–2012 (16 sites) focused on finding federally listed and State conservation concern priority mussel species but did not find any stirrupshells (Miller 1994, pp. 9, 42; McGregor et al. 2009, p. 1; McGregor et al. 2013, p. 1).

Time Since Last Detection

The stirrupshell has not been collected alive since the Sipsey River was surveyed in 1978 (Service 1989, p. 4); one freshly dead shell was last collected from the Sipsey River in 1986 (Service 2000, p. 85). In the Tombigbee River, the stirrupshell has not been collected alive since completion of the Tennessee-Tombigbee Waterway in 1984 (Service 2015, p. 7). Mussel surveys within the Tombigbee River drainage during 1984–2015 failed to document the presence of the stirrupshell (Service 2015, p. 8). The stirrupshell has not been found alive in the Black Warrior River or the Alabama River since the early 1980s (Service 1989, p. 3).

Other Considerations Applicable to the Species' Status

Because the stirrupshell occurred in similar habitat type and area as the flat pigtoe, it faced similar threats. Please refer to the discussion for the flat pigtoe for more information.

III. Analysis

There has been no evidence of the continued existence of the stirrupshell for nearly four decades; the last live individual was observed in 1978 and the last freshly dead specimen was from 1986. Mussel surveys within the Tombigbee River drainage (including the Sipsey and Black Warrior tributaries) from 1984–2015, and the Alabama River from 1997–2007 and in 2011, have failed to document the presence of the species (Service 2015, pp. 5, 8). All known historical habitat has been altered or degraded by impoundments and nonpoint source pollution, and the species is presumed extinct by most authorities.

IV. Conclusion

We conclude that the stirrupshell is extinct and, therefore, should be delisted. This conclusion is based on significant alteration of all known historical habitat and lack of detections during numerous surveys conducted throughout the species' range.

Upland Combshell (Epioblasma Metastriata)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On March 17, 1993, we listed the upland combshell as endangered, primarily due to habitat modification, sedimentation, and water-quality degradation (58 FR 14330). We designated critical habitat on July 1, 2004 (69 FR 40084). Two 5-year reviews were completed in 2008 (initiated on June 14, 2005; see 70 FR 34492) and 2018 (initiated on September 23, 2014; see 79 FR 56821), both recommending delisting the upland combshell due to extinction. We solicited peer review from eight experts for both 5-year reviews from State, Federal, university, nongovernmental, and museum biologists with known expertise and interest in Mobile River Basin mussels (Service 2008, pp. 36–37; Service 2018, p. 15); we received responses from five of the peer reviewers, who concurred with our conclusion that the species is extinct.

The upland combshell was described in 1838, from the Mulberry Fork of the Black Warrior River near Blount Springs, Alabama (58 FR 14330 at 14331, March 17, 1993). Adult upland combshells were rhomboidal to quadrate in shape and were approximately 2.4 inches in length (58 FR 14330–14331, March 17, 1993).

The upland combshell was historically found in shoals in rivers and large streams in the Black Warrior, Cahaba, and Coosa River systems above the Fall Line in Alabama, Georgia, and Tennessee (Service 2000, p. 61). As with many of the freshwater mussels in the Mobile River Basin, it was found in stable sand, gravel, and cobble in moderate to swift currents. The historical range included the Black Warrior River and tributaries (Mulberry Fork and Valley Creek); Cahaba River and tributaries (Little Cahaba River and Buck Creek); and the Coosa River and tributaries (Choccolocco Creek and Etowah, Conasauga, and Chatooga Rivers) (58 FR 14330 at 14331, March 17, 1993). At the time of listing in 1993, the species was estimated to be restricted to the Conasauga River in Georgia, and possibly portions of the upper Black Warrior and Cahaba River drainages (58 FR 14330 at 14331, March 17, 1993; Service 2008, p. 19). The upland combshell was last collected in the Black Warrior River drainage in the early 1900s; in the Coosa River drainage in 1986, from the Conasauga River near the Georgia/Tennessee State line; and the Cahaba River drainage in the early 1970s (58 FR 14330 at 14331, March 17, 1993; Service 2000, p. 61; Service 2018, p. 5).

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

Detection of rare, cryptic, benthic-dwelling animals like freshwater mussels is challenging, and can be affected by a variety of factors. Please refer to ''Species Detectability'' for the flat pigtoe, above, for the descriptions of these factors. The upland combshell was small-sized (with very small juveniles) and most often found buried in sand, gravel, or cobble in fast flowing runs. However, mussels can be found in sub-optimal conditions, depending on where they dropped off of the host fish. Therefore, all of the detection considerations need to be accounted for when trying to detect this mussel species. Despite detection challenges, many well-planned, comprehensive surveys by experienced State and Federal biologists have been carried out, and those surveys have not been able to locate extant populations of upland combshell (Service 2008, p. 19; Service 2018, p. 5).

Survey Effort

Prior to listing in 1993, upland combshell was observed during surveys in the Black Warrior River drainage in the early 1900s; repeated surveys in this drainage in 1974, 1980–1982, 1985, and 1990 did not encounter the species (58 FR 14330 at 14331, March 17, 1993). The upland combshell was observed in the Cahaba River drainage in 1938 and

in 1973, but a 1990 survey failed to find the species in the Cahaba River drainage (58 FR 14330 at 14331, March 17, 1993). The species was observed in the upper Coosa River drainage in Alabama and Georgia in 1966–1968, but not during 1971–1973 surveys; a single specimen was collected in 1988 from the Conasauga River (58 FR 14330 at 14331, March 17, 1993). Both the 2008 and 2018 5-year reviews reference multiple surveys by experienced Federal, State, and private biologists—18 survey reports from 1993–2006 and 10 survey reports from 2008–2017—and despite these repeated surveys of historical habitat in the Black Warrior, Cahaba, and Coosa River drainages, no living animals or fresh or weathered shells of the upland combshell have been located (Service 2008, p. 19; Service 2018, p. 5).

Time Since Last Detection

The most records for the upland combshell are many decades old: from tributaries of the Black Warrior in early 1900s, from the Cahaba River drainage in the early 1970s, and from the Coosa River drainage in the mid-1980s (58 FR 14330 at 14331, March 17, 1993; Service 2008, p. 19; Service 2018, p. 5). No living populations of the upland combshell have been located since the mid-1980s (Service 2000, p. 61; Service 2008, p. 20; Service 2018, p. 7).

Other Considerations Applicable to the Species' Status

Because the upland combshell occurred in similar habitat type and area as the southern acornshell, it faced similar threats. Please refer to the discussion of the southern acornshell, above, for more information on any other overarching consideration.

III. Analysis

There has been no evidence of the continued existence of the upland combshell for over three decades; the last known specimens were collected in the late-1980s. When listed, it was thought that the upland combshell was likely restricted to the Conasauga River in Georgia, and possibly portions of the upper Black Warrior and Cahaba River drainages. Numerous mussel surveys have been completed within these areas, as well as other areas within the historical range of the species since the late 1980s, with no success. Although other federally listed mussels have been found by mussel experts during these surveys, no live or freshly dead specimens of the upland combshell have been found (Service 2018, p. 7). The species is extinct.

IV. Conclusion

We conclude that the upland combshell is extinct and, therefore, should be delisted. This conclusion is based on significant alteration of known historical habitat and lack of detections during numerous surveys conducted throughout the species' range.

Green Blossom (Epioblasma Torulosa Gubernaculum)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On June 14, 1976, we listed the green blossom as endangered (41 FR 24062). At the time of listing, the single greatest factor contributing to the species' decline was the alteration and destruction of stream habitat due to impoundments. Two 5-year reviews were completed in 2007 (initiated on September 20, 2005; see 70 FR 55157) and 2017 (initiated on March 25, 2014; see 79 FR 16366); both reviews recommended delisting due to extinction. For the 2017 5-year review, the Service solicited peer review from eight peer reviewers including Federal and State biologists with known expertise and interest in blossom pearly mussels. All eight peer reviewers indicated there was no new information on the species, or that the species was presumed extirpated or extinct from their respective State(s) (USFWS 2017, pp. 8–9).

The green blossom was described in 1865, with no type locality given for the species. However, all historical records indicate the species was restricted to the upper headwater tributary streams of the Tennessee River above Knoxville (USFWS 1984, pp. 1–2). A comprehensive description of shell anatomy is provided in our 5-year review and supporting documents (Parmalee and Bogan 1998, pp. 104–107).

The green blossom was always extremely rare and never had a wide distribution (USFWS 1984, p. 9). Freshwater mussels found within the Cumberland rivers and tributary streams, such as the green blossom, are most often observed in clean, fast-flowing water in substrates that contain relatively firm rubble, gravel, and sand substrates swept free from siltation (USFWS 1984, p. 5). They are typically found buried in substrate in shallow riffle and shoal areas. This type of habitat has been nearly eliminated by impoundment of the Tennessee and Cumberland Rivers and their headwater tributary streams (USFWS 1984, p. 9).

The genus *Epioblasma* as a whole has suffered extensively because members of this genus are riverine, typically found only in streams that are shallow with sandy-gravel substrate and rapid currents (Stansbery 1972, pp. 45–46). Eight species of *Epioblasma* were extinct at the time of the recovery plan, primarily due to impoundments, siltation, and pollution (USFWS 1984, p. 6).

Stream impoundment affects species composition by eliminating those species not capable of adapting to reduced flows and altered temperatures. Tributary dams typically have storage impoundments with cold water discharges and sufficient storage volume to cause the stream below the dam to differ significantly from pre-impoundment conditions. These hypolimnial discharges result in altered temperature regimes, extreme water-level fluctuations, reduced turbidity, seasonal oxygen deficits, and high concentrations of certain heavy metals (Tennessee Valley Authority (TVA) 1980, entire).

Siltation within the range of the green blossom, resulting from strip mining, coal washing, dredging, farming, and road construction, also likely severely affected the species. Since most freshwater mussels are riverine species that require clean, flowing water over stable, silt-free rubble, gravel, or sand shoals, smothering caused by siltation can be detrimental. Pollution, primarily from wood pulp, paper mills, and other industries, has also severely impacted many streams within the historical range of the species.

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

Detection of rare, cryptic, benthic-dwelling animals like freshwater mussels is challenging, and can be affected by a variety of factors. Please refer to ''Species Detectability'' for the flat pigtoe, above, for the descriptions of these factors. The green blossom was a medium-sized mussel most often found buried in substrate in shallow riffle and shoal areas. However, mussels can be found in sub-optimal conditions, depending on where they dropped off of the host fish.

Survey Effort

As of 1984, freshwater mussel surveys by numerous individuals had failed to document any living populations of green blossom in any Tennessee River tributary other than the Clinch River.

The recovery plan cites several freshwater mussel surveys (which took place between 1972 and 2005) of the Powell River; North, South, and Middle Forks of the Holston River; Big Moccasin Creek; Copper Creek; Nolichucky River; and French Broad River, all of which failed to find living or freshly dead green blossom specimens (USFWS 1984, p. 5). Annual surveys continue to be conducted in the Clinch River since 1972. Biologists conducting those surveys have not reported live or freshly dead individuals of the green blossom (Ahlstedt et al. 2016, entire; Ahlstedt et al. 2017, entire; Jones et al. 2014, entire; Jones et al. 2018, entire).

Time Since Last Detection

The last known record for the green blossom was a live individual collected in 1982, in the Clinch River at Pendleton Island, Virginia.

III. Analysis

Habitat within the historical range of the green blossom has been significantly altered by water impoundments, siltation, and pollution, including at Pendleton Island on the Clinch River, the site of the last known occurrence of the species (Jones et al. 2018, pp. 36–56). The last known collection of the species was 41 years ago, and numerous surveys have been completed within the known range of the species over these 41 years. Although other federally listed mussels have been found by these experts during these surveys, no live or freshly dead specimens of the green blossom have been found (Ahlstedt et al. 2016, pp. 1–18; Ahlstedt et al. 2017, pp. 213–225). Mussel experts conclude that the species is extinct.

IV. Conclusion

We conclude the green blossom is extinct and, therefore, should be delisted. This conclusion is based on lack of detections during surveys and searches conducted throughout the species' range since the green blossom was last observed in 1982, and the amount of significant habitat alteration that has occurred within the range of the species, rendering most of the species' historical habitat unlikely to support the species.

Tubercled Blossom (Epioblasma Torulosa Torulosa)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On June 14, 1976, we listed the tubercled blossom as endangered (41 FR 24062). At the time of listing, the greatest factor contributing to the species' decline was the alteration and destruction of stream habitat due to impoundments. The most recent 5-year review, completed in 2017 (initiated on March 25, 2014; see 79 FR 16366), indicated that the species was extinct, and recommended delisting. The Service solicited peer review from three peer reviewers for the 2017 5-year review from Federal and State biologists with known expertise and interest in blossom pearly mussels. All three peer reviewers indicated there was no new information on the species, all populations of the species were extirpated from their respective States, and the species was presumed extinct.

The tubercled blossom was described as *Amblema torulosa* from the Ohio and Kentucky Rivers (Rafinesque 1820; referenced in USFWS 1985, p. 2). All records for this species indicate it was widespread in the larger rivers of the eastern United States and southern Ontario, Canada (USFWS 1985, p. 2). Records for this species included the Ohio, Kanawha, Scioto, Kentucky, Cumberland, Tennessee, Nolichucky, Elk, and Duck Rivers (USFWS 1985, pp. 3–6). Historical museum records gathered subsequently add the Muskingum, Olentangy, Salt, Green, Barren, Wabash, White, East Fork White, and Hiwassee Rivers to its range (Service 2011, p. 5). The total historical range includes the States of Alabama, Illinois, Indiana, Kentucky, Ohio, Tennessee, and West Virginia. This species was abundant in archaeological sites along the Tennessee River in extreme northwestern Alabama, making it likely that the species also occurred in adjacent northeastern Mississippi where the Tennessee River borders that State (Service 2011, p. 5).

The tubercled blossom was medium-sized, reaching about 3.6 inches (9.1 centimeters) in shell length, and could live 50 years or more. The shell was irregularly egg-shaped or elliptical, slightly sculptured, and corrugated with distinct growth lines. The outer surface was smooth and shiny; was tawny, yellowish-green, or straw-colored; and usually had numerous green rays (Parmalee and Bogan 1980, pp. 22–23).

The genus *Epioblasma* as a whole has suffered extensively because members of this genus are characteristic riffle or shoal species, typically found only in streams that are shallow with sandy-gravel substrate and rapid currents (Parmalee and Bogan 1980, pp. 22–23). Eight species of *Epioblasma* were extinct at the time of the 1985 recovery plan. The elimination of these species has been attributed to impoundments, barge canals, and other flow alteration structures that have eliminated riffle and shoal areas (USFWS 1985, p. 1).

The single greatest factor contributing to the decline of the tubercled blossom is the alteration and destruction of stream habitat due to impoundments for flood control, navigation, hydroelectric power production, and recreation. Siltation is another factor that has severely affected the tubercled blossom. Increased silt transport into waterways due to strip mining, coal washing, dredging, farming, logging, and road construction increased turbidity and consequently reduced the depth of light penetration and created a blanketing effect on the substrate. A third factor is the impact caused by various pollutants. An increasing number of streams throughout the tubercled blossom's range receive municipal, agricultural, and industrial waste discharges.

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

Detection of rare, cryptic, benthic-dwelling animals like freshwater mussels is challenging, and can be affected by a variety of factors. Please refer to ''Species Detectability'' for the flat pigtoe, above, for the descriptions of these factors. The tubercled blossom was a large-river species most often found inhabiting parts of those rivers that are shallow with sandy-gravel substrate and rapid currents. However, mussels can be found in sub-optimal conditions, depending on where they dropped off of the host fish.

Survey Effort

All three rivers where the species was last located have been extensively sampled in the intervening years without further evidence of this species' occurrence, including Kanawha River, Nolichucky River, and Green River (Service 2011, p. 5).

Based on this body of survey information in large rivers in the Ohio River system, investigators have been considering this species as possibly extinct since the mid-1970s. The best reach of potential habitat remaining may be in the lowermost 50 miles of the free-flowing portion of the Ohio River, in Illinois and Kentucky. This reach is one of the last remnants of large-river habitat remaining in the entire historical range of the tubercled blossom. In our 2011 5-year review for the tubercled blossom, we hypothesized that this mussel might be found in this stretch of the Ohio River. Unfortunately, mussel experts have not reported any new collections

of the species (USFWS 2017, p. 8). Additionally, State biologists have conducted extensive surveys within the Kanawha Falls area of the Kanawha River since 2005 and have found no evidence that the tubercled blossom still occurs there (USFWS 2017, p 4). This species is extinct.

Time Since Last Detection

The last individuals were collected live or freshly dead in 1969, in the Kanawha River, West Virginia, below Kanawha Falls; in 1968, in the Nolichucky River, Tennessee; and in 1963, in the Green River, Kentucky.

III. Analysis

The tubercled blossom has not been seen since 1969, despite extensive survey work in nearly all of the rivers of historical occurrence, prompting many investigators to consider this species as possibly extinct. According to the last two 5-year reviews, experts indicate that the species is presumed extinct throughout its range.

IV. Conclusion

We conclude the tubercled blossom is extinct and, therefore, should be delisted. This conclusion is based on the lack of detections during surveys and searches conducted throughout the species' range since the tubercled blossom was last sighted in 1969, and the significant habitat alteration that has occurred within the range of the species, rendering most of the species' habitat unable to support the life-history needs of the species.

Turgid Blossom (Epioblasma Turgidula)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the species background and legal history. Here, we will briefly summarize the species background. On June 14, 1976, we listed the turgid blossom as endangered (41 FR 24062). At the time of listing, the single greatest factor contributing to the species' decline was the alteration and destruction of stream habitat due to impoundments. Two 5-year reviews were completed in 2007 (initiated on September 20, 2005; see 70 FR 55157) and 2017 (initiated on August 30, 2016; see 81 FR 59650); both reviews recommended delisting due to extinction. The Service solicited peer review from eight peer reviewers for the 2017 5-year review from Federal and State biologists with known expertise and interest in blossom pearly mussels (the turgid blossom was one of four species assessed in this 5-year review). All eight peer reviewers indicated there was no new information on the species, all populations of the species were extirpated from their respective States, and the species was presumed extinct.

The turgid blossom was described (Lea 1858; referenced in USFWS 1985, p. 2) as *Unio turgidulus* from the Cumberland River, Tennessee, and the Tennessee River, Florence, Alabama. It has been reported from the Tennessee River and tributary streams, including Shoal and Bear Creeks, and Elk, Duck, Holston, Clinch, and Emory Rivers (USFWS 2017, p. 4). Additional records are reported from the Cumberland River (USFWS 2017, p. 4) and from the Ozark Mountain Region, including Spring Creek, and Black and White Rivers (USFWS 2017, p. 6).

The turgid blossom was a medium-river, Cumberlandian-type mussel that was also reported from the Ozarks. These mussels could live 50 years or more. The genus *Epioblasma* as a whole has suffered extensively because members of this genus are characteristic riffle or shoal species, typically found only in streams that are shallow with sandy-gravel substrate and rapid currents (Parmalee et al. 1980, pp. 93–105). Eight species of *Epioblasma* were extinct at the time of the 1985 recovery plan. The elimination of these species has been attributed to impoundments, barge canals, and other flow alteration structures that have eliminated riffle and shoal areas (USFWS 1985, p. 1). The last known population of the turgid blossom occurred in the Duck River and was collected in 1972, at Normandy (Ahlstedt 1980, pp. 21–23). Field notes associated with this collection indicate that it was river-collected 100 yards above an old iron bridge. Water at the bridge one mile upstream was very muddy, presumably from dam construction above the site (Ahlstedt et al. 2017, entire). Additionally, surveys in the 1960s of the upper Cumberland Basin indicated an almost total elimination of the genus *Epioblasma,* presumably due to mine wastes (Neel and Allen 1964, as cited in USFWS 1985, p. 10).

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

Detection of rare, cryptic, benthic-dwelling animals like freshwater mussels is challenging, and can be affected by a variety of factors. Please refer to ''Species Detectability'' for the flat pigtoe, above, for the descriptions of these factors. The turgid blossom was a small-sized mussel most often found buried in substrate in shallow riffle and shoal areas. However, mussels can be found in sub-optimal conditions, depending on where they dropped off of the host fish.

Survey Effort

This species has not been found in freshwater mussel surveys conducted on the Duck River since the time of the Normandy Dam construction (Ahlstedt 1980, pp. 21–23), nor has it been reported from any other stream or river system. The most recent 5-year review notes that the Tennessee Wildlife Resources Agency had completed or funded surveys (1972–2005) for blossom pearly mussels in the Cumberland, Tennessee, Clinch, Duck, Elk, Emory, Hiwassee, Little, and Powell Rivers, yet there were no recent records of turgid blossom (USFWS 2017, p. 4). Surveys in the Ozarks have not observed the species since the early 1900s (USFWS 1985, p. 7).

Time Since Last Detection

The last known collection of the turgid blossom was a freshly dead specimen found in the Duck River, Tennessee, in 1972 by a biologist with the TVA. The species has not been seen in the Ozarks since the early 1900s (USFWS 1985, p. 7).

III. Analysis

Habitat within the historical range of the turgid blossom has been significantly altered by water impoundments, siltation, and pollution. The last known collection of the species was more than 45 years ago. Mussel experts conclude that the species is likely to be extinct. Numerous surveys have been completed within the known range of the species over the years. Although other federally listed mussels have been found by experts during these surveys, no live or freshly dead specimens of the turgid blossom have been found.

IV. Conclusion

We conclude the turgid blossom is extinct and, therefore, should be delisted. This conclusion is based on the lack of detections during surveys and searches conducted throughout the species' range since the turgid blossom was last sighted in 1972, and the significant habitat alteration that occurred within the range of the species, rendering most of the species' habitat unlikely to support the species.

Yellow Blossom (Epioblasma Florentina Florentina)

I. Background

Please refer to our proposed rule, published on September 30, 2021 (86 FR 54298), for a thorough review of the

species background and legal history. Here, we will briefly summarize the species background. On June 14, 1976, listed the yellow blossom as endangered (41 FR 24062). At the time of listing, the single greatest factor contributing to the species' decline was the alteration and destruction of stream habitat due to impoundments. Two 5-year reviews were completed in 2007 (initiated on September 20, 2005; see 70 FR 55157) and 2017 (initiated on March 25, 2014; see 79 FR 16366); both reviews recommended delisting due to extinction. The Service solicited peer review from eight peer reviewers for the 2017 5-year review from Federal and State biologists with known expertise and interest in blossom pearly mussels (the yellow blossom was one of four species assessed in this 5-year review). All eight peer reviewers indicated there was no new information on the species, all populations of the species were extirpated from their respective States, and the species was presumed extinct.

The yellow blossom was described (Lea 1857; referenced in USFWS 1985, pp. 2–3) as *Unio florentinus* from the Tennessee River, Florence and Lauderdale Counties, Alabama, and the Cumberland River, Tennessee. The yellow blossom was reported from Hurricane, Limestone, Bear, and Cypress Creeks, all tributary streams to the Tennessee River in northern Alabama (Ortmann 1925 p. 362; Bogan and Parmalee 1983, p. 23). This species was also reported from larger tributary streams of the lower and upper Tennessee River, including the Flint, Elk, and Duck Rivers (Isom et al. 1973, p. 439; Bogan and Parmalee 1983, pp. 22–23) and the Holston, Clinch, and Little Tennessee Rivers (Ortmann 1918, pp. 614–616). Yellow blossoms apparently occurred throughout the Cumberland River (Wilson and Clark 1914, p. 46; Ortmann 1918, p. 592; Neel and Allen 1964, p. 448).

The yellow blossom seldom achieved more than 2.4 inches (6 centimeters) in length. The slightly inflated valves were of unequal length, and the shell surface was marked by uneven growth lines. The shell was a shiny honey-yellow or tan with numerous green rays uniformly distributed over the surface. The inner shell surface was bluish-white (Bogan and Parmalee 1983, pp. 22–23).

The genus *Epioblasma* as a whole has suffered extensively because members of this genus are characteristic riffle or shoal species, typically found only in streams that are shallow with sandy-gravel substrate and rapid currents (Bogan and Parmalee 1983, pp. 22–23). Eight species of *Epioblasma* were extinct at the time of the 1985 recovery plan. The elimination of these species has been attributed to impoundments, barge canals, and other flow alteration structures that have eliminated riffle and shoal areas (USFWS 1985, p. 1).

The single greatest factor contributing to the decline of the yellow blossom, not only in the Tennessee Valley but in other regions as well, is the alteration and destruction of stream habitat due to impoundments for flood control, navigation, hydroelectric power production, and recreation. Siltation is another factor that has severely affected the yellow blossom. Increased silt transport into waterways due to strip mining, coal washing, dredging, farming, logging, and road construction increased turbidity and consequently reduced light penetration, creating a blanketing effect on the substrate. A third factor is the impact caused by various pollutants. An increasing number of streams throughout the mussel's range receive municipal, agricultural, and industrial waste discharges (USFWS 2017, p. 5).

II. Information on Detectability, Survey Effort, and Time Since Last Detection

Species Detectability

Detection of rare, cryptic, benthic-dwelling animals like freshwater mussels is challenging, and can be affected by a variety of factors. Please refer to ''Species Detectability'' for the flat pigtoe, above, for the descriptions of these factors. The yellow blossom was a small-sized mussel most often found buried in substrate in shallow riffle and shoal areas. However, mussels can be found in sub-optimal conditions, depending on where they dropped off of the host fish.

Survey Effort

Since the last recorded collections in the mid-1960s, numerous mussel surveys (1872–2005) have been done by mussel biologists from the TVA, Virginia Tech, U.S. Geological Survey, and others in rivers historically containing the species. Biologists conducting those surveys have not reported live or freshly dead individuals of the yellow blossom.

Time Since Last Detection

This species was last collected live from Citico Creek in 1957, and the Little Tennessee River in the 1966 (Bogan and Parmalee, 1983, p. 23), and archeological shell specimens were collected from the Tennessee and Cumberland Rivers between 1976 and 1979 (Parmalee et al. 1980, entire).

III. Analysis

Habitat within the historical range of the yellow blossom has been significantly altered by water impoundments, siltation, and pollution. The last known collection of the species was over 50 years ago. Mussel experts conclude that the species is likely to be extinct. Numerous surveys have been completed within the known range of the species over the years. Although other federally listed mussels have been found by these experts during these surveys, no live or freshly dead specimens of the yellow blossom have been found.

IV. Conclusion

We conclude the yellow blossom is extinct and, therefore, should be delisted. This conclusion is based on lack of detections during surveys conducted throughout the species' range since the yellow blossom was last sighted in the mid-1960s and on the significant habitat alteration that occurred within the range of the species, rendering most of the species' habitat unlikely to support the species.

Required Determinations

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

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 regulations adopted pursuant to section 4(a) of the Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244). Further, NEPA analyses are not applicable for the removal of any associated rules (*e.g.,* critical habitat) as the removal of those rules are required with the delisting of a species.

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. The Seminole Tribe of Florida and the Miccousukee Tribe have expressed interest in the Bachman's warbler. We reached out to these Tribes by providing an advance notification prior to the publication of the September 30, 2021, proposed rule (86 FR 54298). We received no comments from any Tribes during the public comment period on the proposed rule.

References Cited

Lists of the references cited in in this document are available on the internet at *https://www.regulations.gov* in the dockets provided above under **ADDRESSES** and upon request from the appropriate person, as specified under **FOR FURTHER INFORMATION CONTACT**.

Authors

The primary authors of this document are the staff members of the Branch of Delisting and Foreign Species, Ecological Services Program, as well as the staff of the Ecological Services Field Offices as specified under **FOR FURTHER INFORMATION CONTACT**.

List of Subjects in 50 CFR Part 17

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

Regulation Promulgation

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

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

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

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

§ 17.11 [Amended]

■ 2. Amend § 17.11 in paragraph (h), the List of Endangered and Threatened Wildlife, by:
■ a. Under MAMMALS, removing the entry for ''Bat, little Mariana fruit'';
■ b. Under BIRDS, removing the entries for ''Akepa, Maui'', ''Akialoa, Kauai'', ''Creeper, Molokai'', ''Nukupuu, Kauai'', ''Nukupuu, Maui'', ''ʻOʻo, Kauai (honeyeater)'', ''Poʻouli (honeycreeper)'', ''Thrush, large Kauai'', ''Warbler (wood), Bachman's'', and ''White-eye, bridled'';
■ c. Under FISHES, removing the entries for ''Gambusia, San Marcos'' and ''Madtom, Scioto''; and
■ d. Under CLAMS, removing the entries for ''Acornshell, southern'' and ''Blossom, green''; both entries for ''Blossom, tubercled'', ''Blossom, turgid'', and ''Blossom, yellow''; and the entries for ''Combshell, upland'', ''Pigtoe, flat'', and ''Stirrupshell''.

§ 17.85 [Amended]

■ 3. Amend § 17.85 by:
■ a. In paragraph (a) introductory text:
■ i. In the heading, removing the word ''*Seventeen*'' and adding in its place the word ''*Fourteen*''; and
■ ii. In the table, removing the entries for ''tubercled blossom (pearlymussel)'', ''turgid blossom (pearlymussel)'', and ''yellow blossom (pearlymussel)'';
■ b. In paragraph (a)(1)(i), removing the number ''17'' and adding in its place the number ''14'';
■ c. In paragraph (a)(1)(ii), removing the number ''17'' and adding in its place the number ''14''; and
■ d. In paragraph (a)(2)(iii), by removing the number ''17'' and adding in its place the number ''14''.

■ 4. Amend § 17.95 by:
■ a. In paragraph (e), removing the entry for ''San Marcos Gambusia (*Gambusia georgei*)''; and
■ b. In paragraph (f), in the entry for ''Eleven Mobile River Basin Mussel Species: Southern acornshell (*Epioblasma othcaloogensis*), ovate clubshell (*Pleurobema perovatum*), southern clubshell (*Pleurobema decisum*), upland combshell (*Epioblasma metastriata*), triangular kidneyshell (*Ptychobranchus greenii*), Alabama moccasinshell (*Medionidus acutissimus*), Coosa moccasinshell (*Medionidus parvulus*), orangenacre mucket (*Hamiota perovalis*), dark pigtoe (*Pleurobema furvum*), southern pigtoe (*Pleurobema georgianum*), and finelined pocketbook (*Hamiota altilis*)'', revising the entry's heading, the first sentence of paragraph (1) introductory text, the introductory text of paragraph (2)(i), the table in paragraph (2)(ii), the introductory text of paragraph (2)(xiv), paragraph (2)(xiv)(B), the introductory text of paragraph (2)(xv), paragraph (2)(xv)(B), the introductory text of paragraph (2)(xx), paragraph (2)(xx)(B), the introductory text of paragraph (2)(xxi), paragraph (2)(xxi)(B), the introductory text of paragraph (2)(xxiii), paragraph (2)(xxiii)(B), the introductory text of paragraph (2)(xxvi), paragraph (2)(xxvi)(B), the introductory text of paragraph (2)(xxvii), paragraph (2)(xxvii)(B), the introductory text of paragraph (2)(xxviii), and paragraph (2)(xxviii)(B).

The revisions read as follows:

§ 17.95 Critical habitat—fish and wildlife.

* * * * *

(f) *Clams and Snails.*

* * * * *

Nine Mobile River Basin Mussel Species: Ovate Clubshell (Pleurobema Perovatum), Southern Clubshell (Pleurobema Decisum), Triangular Kidneyshell (Ptychobranchus Greenii), Alabama Moccasinshell (Medionidus Acutissimus), Coosa Moccasinshell (Medionidus Parvulus), Orange-Nacre Mucket (Hamiota Perovalis), Dark Pigtoe (Pleurobema Furvum), Southern Pigtoe (Pleurobema Georgianum), and Fine-Lined Pocketbook (Hamiota Altilis)

(1) The primary constituent elements essential for the conservation of the ovate clubshell (*Pleurobema perovatum*), southern clubshell (*Pleurobema decisum*), triangular kidneyshell (*Ptychobranchus greenii*), Alabama moccasinshell (*Medionidus acutissimus*), Coosa moccasinshell (*Medionidus parvulus*), orange-nacre mucket (*Hamiota perovalis*), dark pigtoe (*Pleurobema furvum*), southern pigtoe (*Pleurobema georgianum*), and fine-lined pocketbook (*Hamiota altilis*) are those habitat components that support feeding, sheltering, reproduction, and physical features for maintaining the natural processes that support these habitat components. * * *

(2) * * *

(i) *Index map.* The index map showing critical habitat units in the States of Mississippi, Alabama, Georgia, and Tennessee for the nine Mobile River Basin mussel species follows:

* * * * *

(ii) * * *

TABLE 1 TO NINE MOBILE RIVER BASIN MUSSEL SPECIES PARAGRAPH (2)(ii)

Species	Critical habitat units	States
Ovate clubshell (*Pleurobema perovatum*)	Units 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 17, 18, 19, 21, 24, 25, 26.	AL, GA, MS, TN.

Appendix D3 | **USFWS's Findings on the Texas Troglobitic Water Slater**

www.govinfo.gov. At this site you can view this document, as well as all other documents of this Department published in the **Federal Register**, in text or Portable Document Format (PDF). To use PDF, you must have Adobe Acrobat Reader, which is available free at the site. You may also access the documents of the Department published in the **Federal Register** by using the article search feature at *www.federalregister.gov.* Specifically, through the advanced search feature at this site, you can limit your search to documents published by the Department.

Authority: Program Authority: 20 U.S.C. 1098a.

Nasser H. Paydar,

Assistant Secretary, Office of Postsecondary Education.

[FR Doc. 2023–26198 Filed 11–28–23; 8:45 am]

BILLING CODE 4000–01–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[FF09E21000 FXES1111090FEDR245]

Endangered and Threatened Wildlife and Plants; Seven Species Not Warranted for Listing as Endangered or Threatened Species

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notification of findings.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce findings that seven species are not warranted for listing as endangered or threatened species under the Endangered Species Act of 1973, as amended (Act). After a thorough review of the best available scientific and commercial information, we find that it is not warranted at this time to list Edison's ascyrum (*Hypericum edisonianum*), Florida (lowland) loosestrife (*Lythrum flagellare*), Florida pinesnake (*Pituophis melanoleucus mugitu*), mimic cavesnail (*Phreatodrobia imitata*), northern cavefish (*Amblyopsis spelaea*), smallscale darter (*Etheostoma microlepidum*), and Texas troglobitic water slater (*Lirceolus smithii*). However, we ask the public to submit to us at any time any new information relevant to the status of any of the species mentioned above or their habitats.

DATES: The findings in this document were made on November 29, 2023.

ADDRESSES: Detailed descriptions of the bases for these findings are available on the internet at *https://www.regulations.gov* under the following docket numbers:

Species	Docket No.
Edison's ascyrum	FWS–R4–ES–2023–0172
Florida (lowland) loosestrife	FWS–R4–ES–2023–0173
Florida pinesnake	FWS–R4–ES–2023–0174
Mimic cavesnail	FWS–R2–ES–2023–0175
Northern cavefish	FWS–R4–ES–2023–0176
Smallscale darter	FWS–R4–ES–2023–0177
Texas troglobitic water slater	FWS–R2–ES–2023–0178

Those descriptions are also available by contacting the appropriate person as specified under **FOR FURTHER INFORMATION CONTACT**. Please submit any new information, materials, comments, or questions concerning this finding to the appropriate person, as specified under **FOR FURTHER INFORMATION CONTACT**.

FOR FURTHER INFORMATION CONTACT:

Species	Contact information
Edison's ascyrum, Florida (lowland) loosestrife, and Florida pinesnake.	Lourdes Mena, Division Manager, Florida Ecological Services Field Office, *lourdes_mena@fws.gov*, 904–460–4970.
Mimic cavesnail and Texas troglobitic water slater.	Karen Myers, Field Supervisor, Austin Ecological Services Field Office, *karen_myers@fws.gov*, 512–937–7371.
Northern cavefish	Lee Andrews, Field Supervisor, Kentucky Ecological Services Field Office, *lee_andrews@fws.gov*, 502–695–0468 ext. 46108.
Smallscale darter	Dan Elbert, Field Supervisor, Tennessee Ecological Services Field Office, *daniel_elbert@fws.gov*, 931–525–4973.

Individuals in the United States who are deaf, deafblind, hard of hearing, or have a speech disability may dial 711 (TTY, TDD, or TeleBraille) to access telecommunications relay services. Individuals outside the United States should use the relay services offered within their country to make international calls to the point-of-contact in the United States.

SUPPLEMENTARY INFORMATION:

Background

Under section 4(b)(3)(B) of the Act (16 U.S.C. 1531 *et seq.*), we are required to make a finding on whether or not a petitioned action is warranted within 12 months after receiving any petition that we have determined contains substantial scientific or commercial information indicating that the petitioned action may be warranted (''12-month finding''). We must make a finding that the petitioned action is: (1) Not warranted; (2) warranted; or (3) warranted, but precluded by other listing activity. We must publish a notification of these 12-month findings in the **Federal Register**.

Summary of Information Pertaining to the Five Factors

Section 4 of the Act (16 U.S.C. 1533) and the implementing regulations at part 424 of title 50 of the Code of Federal Regulations (50 CFR part 424) set forth procedures for adding species to, removing species from, or reclassifying species on the Lists of Endangered and Threatened Wildlife and Plants (Lists). The Act defines ''species'' as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife

which interbreeds when mature. The Act defines ''endangered species'' as any species that is in danger of extinction throughout all or a significant portion of its range (16 U.S.C. 1532(6)), and ''threatened species'' as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (16 U.S.C. 1532(20)). Under section 4(a)(1) of the Act, a species may be determined to be 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; 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 of the Interior 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.

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 Service 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.

In conducting our evaluation of the five factors provided in section 4(a)(1) of the Act to determine whether the Edison's ascyrum, Florida (lowland) loosestrife, Florida pinesnake, mimic cavesnail, northern cavefish, smallscale darter, or Texas troglobitic water slater meet the Act's definition of ''endangered species'' or ''threatened species,'' we considered and thoroughly evaluated the best scientific and commercial information available regarding the past, present, and future stressors and threats. We reviewed the petitions, information available in our files, and other available published and unpublished information for all of these species. Our evaluation may include information from recognized experts; Federal, State, and Tribal governments; academic institutions; foreign governments; private entities; and other members of the public.

In accordance with the regulations at 50 CFR 424.14(h)(2)(i), this document announces the not-warranted findings on petitions to list seven species. We have also elected to include brief summaries of the analyses on which these findings are based. We provide the full analyses, including the reasons and data on which the findings are based, in the decisional file for each of the seven actions included in this document. The following is a description of the documents containing these analyses:

The species assessment forms for the Edison's ascyrum, Florida (lowland) loosestrife, Florida pinesnake, mimic cavesnail, northern cavefish, smallscale darter, and Texas troglobitic water slater contain more detailed biological information, a thorough analysis of the listing factors, a list of literature cited, and an explanation of why we determined that these species do not meet the Act's definition of an ''endangered species'' or a ''threatened species.'' To inform our status reviews, we completed species status assessment (SSA) reports for these seven species. Each SSA report contains a thorough review of the taxonomy, life history, ecology, current status, and projected future status for each species. This supporting information can be found on the internet at *https://www.regulations.gov* under the appropriate docket number (see **ADDRESSES**, above).

Edison's Ascyrum

Previous Federal Actions

On April 20, 2010, we received a petition from the Center for Biological Diversity, Alabama Rivers Alliance, Clinch Coalition, Dogwood Alliance, Gulf Restoration Network, Tennessee Forests Council, and West Virginia Highlands to list 404 aquatic, riparian, and wetland species, including Edison's ascyrum, as endangered or threatened species under the Act. On September 27, 2011, we published in the **Federal Register** (76 FR 59836) a 90-day finding that the petition contained substantial information indicating that listing may be warranted for Edison's ascyrum. This document constitutes our 12-month finding on the 2010 petition to list Edison's ascryum under the Act.

Summary of Finding

Edison's ascyrum is a small colonial shrub in the St. John's wort family (Hypericaceae) that can grow to 1.5 meters (m) (5 feet (ft)) tall. The species occurs most abundantly in seasonal ponds (*i.e.,* depression marshes), but

also inhabits flatwoods, wet prairies, cutthroat grass seeps, lake margins, and occasionally roadsides and semi-native pastures. Edison's ascyrum is confined mostly to the southern Lake Wales Ridge in central peninsular Florida. The Lake Wales Ridge is a 186-kilometer (km) (116-mile (mi)) long, major geomorphological feature stretching from just south of Lake Harris in Lake County to near the Highlands/Glades County line. The species was historically known from only Highlands and Glades Counties, and it currently occurs in abundance in these two counties. Additional vouchered counties include DeSoto, Polk, and Collier.

Edison's ascyrum can flower year-round but usually reproduces via clonal propagation. Genets (genetically distinct individuals) are usually composed of several ramets that sprout from underground rhizomes. Edison's ascyrum is able to rapidly regenerate ramets following disturbances such as fire and prolonged inundation, which likely enhances both genet fitness and persistence.

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the Edison's ascyrum, and we evaluated all relevant factors under the five listing factors, including any regulatory mechanisms and conservation measures addressing these threats. The primary threats identified for Edison's ascyrum's biological status include habitat loss and degradation, changes in fire patterns, and hydrological changes. Habitat loss and degradation are expected to be driven by development, which, along with climate change, will potentially cause hydrological changes. However, approximately 77 percent of the known occurrences are on conservation lands, which are managed in ways that benefit the species and its habitat. Since recent estimates of population size were not available for most features, we used a habitat-based approach to assess the resiliency of each analysis unit. Specifically, we considered four factors: area of available habitat, percentage of incompatible land use, habitat protection, and habitat management. Thirteen of the 22 analysis units (AUs) identified throughout the species' range have moderate to high resiliency. Through this resiliency assessment, we found that AUs that exhibit a moderate or high rank for habitat management are distributed throughout the range. There is some risk from development, altered hydrology, and altered fire patterns due to the localized nature of this species' range, but the species is thriving in several areas under long-term protection and management. Although the species has a narrow range, four of the AUs of high-moderate to high resiliency are distributed from north to south across Avon Park Air Force Range, Archbold Biological Station, and Fisheating Creek Wildlife Management Area. Thus, after assessing the best available information, we conclude that the Edison's ascyrum is not in danger of extinction throughout all of its range.

We then considered whether the species is likely to become in danger of extinction within the foreseeable future throughout its range. Habitat loss and degradation, fire exclusion, and hydrological changes are the biggest threats to the species in the future. Habitat loss and degradation in the future is expected to be driven by population growth and development in the species' habitat, as well as hydrological changes due to development and climate change. We evaluated the future condition of the species under two future scenarios at two timesteps (2040 and 2070). In the future, resiliency is projected to vary between AUs, but the species is projected to be represented by moderate to high resiliency populations throughout its range. The distribution of moderate to high resiliency populations across the range on protected lands may minimize the likelihood of a catastrophic event affecting the species rangewide. Additionally, under both scenarios and for both timesteps, AUs not expected to decrease in resiliency remain spread across the range of the species. Under scenario 1, resiliency is projected to decrease in 8 AUs by 2040, and 12 AUs by 2070. Under scenario 2, under both timesteps, resiliency is projected to decrease in 5 AUs. Overall, the species will remain represented across the range. In addition, 77 percent of the known occurrences are on conservation lands. Thus, after assessing the best available information, we conclude that Edison's ascyrum is not in danger of extinction throughout all of its range now, or within the foreseeable future.

We also evaluated whether the Edison's ascyrum is endangered or threatened in a significant portion of its range. We did not find any portions of the Edison's ascyrum's range for which both (1) the portion is significant; and (2) the species is in danger of extinction in that portion, either now or within the foreseeable future. Thus, after assessing the best available information, we conclude that the Edison's ascyrum is not in danger of extinction in a significant portion of its range now, or within the foreseeable future.

After assessing the best available information, we concluded that Edison's ascyrum is not in danger of extinction or likely to become in danger of extinction within the foreseeable future throughout all of its range or in any significant portion of its range. Therefore, we find that listing the Edison's ascyrum as an endangered species or threatened species under the Act is not warranted. A detailed discussion of the basis for this finding can be found in the Edison's ascyrum species assessment form and other supporting documents on *https://www.regulations.gov* under Docket No. FWS–R4–ES–2023–0172 (see **ADDRESSES**, above).

Peer Review

In accordance with our July 1, 1994, peer review policy (59 FR 34270; July 1, 1994) and the Service's August 22, 2016, Director's Memo on the Peer Review Process, we solicited independent scientific reviews of the information contained in the Edison's ascyrum SSA report. The Service sent the SSA report to eight independent peer reviewers and received two responses. Results of this structured peer review process can be found at *https://www.regulations.gov.* We incorporated the results of these reviews, as appropriate, into the SSA report, which is the foundation for this finding.

Florida (Lowland) Loosestrife

Previous Federal Actions

On April 20, 2010, we received a petition from the Center for Biological Diversity, Alabama Rivers Alliance, Clinch Coalition, Dogwood Alliance, Gulf Restoration Network, Tennessee Forests Council, and West Virginia Highlands to list 404 aquatic, riparian, and wetland species, including lowland (Florida) loosestrife, as endangered or threatened species under the Act. On September 27, 2011, we published in the **Federal Register** (76 FR 59836) a 90-day finding that the petition contained substantial information indicating that listing may be warranted for Florida (lowland) loosestrife. This document constitutes our 12-month finding on the 2010 petition to list Florida loosestrife under the Act.

Summary of Finding

Florida loosestrife is a perennial herb endemic to the subtropical zone of Florida, largely on the western side of the State. The species occurs in seasonally inundated open areas and can tolerate moderate levels of

disturbance. For example, it can be found in roadside ditches and disturbed wetlands along with swamps, marshes, and wet prairies. The species can be very abundant where it occurs, often numbering in the thousands, forming dense mats and dominating the groundcover. Both the historical and current distribution of Florida loosestrife is not fully known. Vouchered counties include Charlotte, Collier, DeSoto, Glades, Hardee, Hendry, Hernando, Hillsborough, Lee, Manatee, Okeechobee, Orange, and Sarasota. However, the species has also been documented in Broward and Citrus Counties and reported in Palm Beach County.

Little is known about the life history of Florida loosestrife. It is reported that it flowers year-round, but it likely most reliably flowers in spring. Plants that experience seasonal flooding beginning in late spring to early summer must flower and set seed before they are inundated. Florida loosestrife seeds likely disperse within floodplains via sheet flow. Pollinators are not known.

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the Florida loosestrife, and we evaluated all relevant factors under the five factors, including any regulatory mechanisms and conservation measures addressing these threats. The primary threats identified for Florida loosestrife include direct and indirect impacts of development and sea level rise (SLR). The species' range is moderately restricted, occurring in 12 counties and 35 watersheds, with many of the records occurring in the last few years as efforts to locate the species have increased.

Current threats to the species are largely related to habitat conversion associated with urbanization and other development (*e.g.,* agriculture); however, the species continues to occur in urbanized and other developed areas, albeit in highly altered habitats. The species' ability to survive in different settings is reflected in the species' resiliency; as documented in the SSA report, 22 of the 35 units have at least moderate resiliency. Given the apparent resiliency of the plants in developed areas, the high number of units with moderate to very high resiliency, and the species' ability to adapt to disturbed environments, the species is not in danger of extinction throughout all of its range.

Next, we considered whether the Florida loosestrife is likely to become endangered within the foreseeable future throughout all of its range. For the Florida loosestrife, habitat loss and degradation (from urban and agricultural development) and SLR are projected to be the biggest threats to the species in the future. To evaluate the future condition of the species, we developed two plausible future scenarios to project the outcomes of future urban and agricultural development and SLR at two timesteps (2040 and 2070). However, even under higher projected development and SLR scenarios, the species is expected to have sufficient redundancy with several moderate to high resiliency populations distributed across the range of the species. We, therefore, determined that the scale of impacts projected in the future will not affect the species such that it is likely to become an endangered species in the foreseeable future. Thus, after assessing the best available information, we conclude that Florida loosestrife is not in danger of extinction now, or within the foreseeable future throughout all of its range.

We also evaluated whether the Florida loosestrife is endangered or threatened in a significant portion of its range. We did not find any portions of the Florida loosestrife's range for which both (1) the portion is significant; and (2) the species is in danger of extinction in that portion, either now or within the foreseeable future. Thus, after assessing the best available information, we conclude that the Florida loosestrife is not in danger of extinction in a significant portion of its range now, or within the foreseeable future.

After assessing the best available information, we concluded that Florida loosestrife is not in danger of extinction or likely to become in danger of extinction within the foreseeable future throughout all of its range or in any significant portion of its range. Therefore, we find that listing the Florida loosestrife as an endangered species or threatened species under the Act is not warranted. A detailed discussion of the basis for this finding can be found in the Florida loosestrife species assessment form and other supporting documents on *https://www.regulations.gov* under Docket No. FWS–R4–ES–2023–0173 (see **ADDRESSES**, above).

Peer Review

In accordance with our July 1, 1994, peer review policy (59 FR 34270; July 1, 1994) and the Service's August 22, 2016, Director's Memo on the Peer Review Process, we solicited independent scientific reviews of the information contained in the Florida loosestrife SSA report. The Service sent the SSA report to six independent peer reviewers and received two responses. Results of this structured peer review process can be found at *https://www.regulations.gov.* We incorporated the results of these reviews, as appropriate, into the SSA report, which is the foundation for this finding.

Florida Pinesnake

Previous Federal Actions

On July 11, 2012, the Service was petitioned by the Center for Biological Diversity, Thomas Lovejoy, Kenney Krysko, C. Kenneth Dodd, Jr., Allen Salzberg, Edward O. Wilson, and Michael J. Lannoo to list 53 amphibians and reptiles in the United States, including the Florida pinesnake, as endangered or threatened species under the Act. In response to the petition, on September 18, 2015, the Service published in the **Federal Register** (80 FR 56423) a 90-day finding that the petition contained substantial information indicating the Florida pinesnake may warrant listing. This document constitutes our 12-month finding on the 2012 petition to list the Florida pinesnake under the Act.

Summary of Finding

The Florida pinesnake is a large, non-venomous, diurnal, and highly fossorial constrictor endemic to the Coastal Plains of the southeastern United States. Its recognized range spans from southeastern South Carolina, through central and south Georgia, to south Florida and west into the Florida panhandle and the southern part of Alabama. This subspecies exhibits a strong preference for pine forests with open-canopy, well-drained, sandy soil, and frequent fires. Five main habitat elements that appear to be essential to the survival and reproductive success of individuals are well-drained soils, suitable vegetation structure and composition, low nearby road density, an appropriate fire return interval, and presence of prey. Pinesnakes are active foragers that hunt a variety of prey both above and below ground. As accomplished burrowers, they can tunnel through loose soil, dig nests, and excavate rodents for food. They also use existing underground burrows and tunnels created by other species, such as the southeastern pocket gopher (*Geomys pinetis*), for refugia.

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the Florida pinesnake, and we evaluated all relevant factors under the five listing factors, including any regulatory mechanisms and conservation measures addressing these threats. Florida

pinesnakes are associated with various actions that are associated with the loss and degradation of habitat. Habitat loss is due to a number of factors, including fire suppression, historical and incompatible silvicultural practices, SLR, conversion of land to agriculture, and urbanization. The current constraints on the ability to manage pine habitat through prescribed fire may be exacerbated by urbanization and climate change in the future. It is possible that several of these factors are acting synergistically to impact the Florida pinesnake.

Although there is still uncertainty surrounding the evaluated stressors and their synergistic effects, habitat loss and modification, due to the effects of both urban development and climate change, were considered in the assessment of Florida pinesnake populations and the subspecies' overall viability. Currently, across the subspecies' range, there are no documented impacts at the population level from invasive species, persecution or increased harassment, overcollection for the pet trade, or disease. While habitat loss and modification are the primary factor influencing the subspecies, many Florida pinesnake populations have moderate to high resiliency in the face of these threats.

It is estimated that Florida pinesnakes have likely lost 30.8 percent (41 of 133 populations) of their historical populations due to loss and degradation of habitat, representing 9 percent of the total occupied range of the subspecies. The remaining 69.2 percent of the populations, covering 90.4 percent of the total historical range, have a greater than 50 percent probability of persisting, and are considered extant as of 2021. Of the extant populations, 71.2 percent of populations (66 populations) covering 93.2 percent of the current occupied range are very likely or extremely likely to persist as of 2021, and they have moderate to high resiliency. Thirty-one and half percent of populations covering 77.1 percent of the current occupied range are considered to have high resiliency. We estimate that all seven representative units have likely lost at least one historic, delineated population. Despite this decrease from the historical number of populations, all representative units have multiple populations, which meets our criteria for high redundancy. Because two representative units do not have populations in the highest persistence category, and those units are on the northern and western portions of the subspecies range, we consider the current representation to be moderate. We, therefore, conclude that the Florida pinesnake is not in danger of extinction throughout all of its range.

In considering the foreseeable future as it relates to the status of the Florida pinesnake, we considered the relevant risk factors (*i.e.,* threats/stressors) affecting the subspecies and whether we could draw reliable predictions about the subspecies' response to these factors. We considered whether we could reliably assess the risk posed by the threats to the subspecies, recognizing that our ability to assess risk is limited by the variable quantity and quality of available data about effects to the Florida pinesnake and its response to those threats.

In the future, land-use change and other anthropogenic activities may impact Florida pinesnake habitat through loss of habitat and fragmentation. Our analysis of two future scenarios until 2080 encompasses the best available information for future projections of levels of urbanization, and it uses two different representative concentration pathways (RCPs) for climate change (*i.e.,* A1B and B2) to look at the effects of SLR and prescribed burn windows. We determined that that timeframe enables us to consider the threats/stressors acting on the subspecies and to draw reliable predictions about the subspecies' response to these threats/stressors.

Loss of habitat and fragmentation threats associated with urbanization and climate change are projected to occur throughout the subspecies' range. The importance of protected lands and managing habitats through burning will continue to play an important role for this subspecies. Given the future scenarios, the resiliency of Florida pinesnake populations are projected to decline in the future. Under both scenarios, in 2040, 30 populations are projected to have moderate or high resiliency, covering 73 percent of the occupied range. Under both scenarios, at 2080, 11 populations are projected to have moderate or high resiliency, covering 62 percent of the occupied range. Subspecies' representation and redundancy are projected to decrease from moderate and high, respectively, in current condition levels to moderate in the future. The number of representative units with populations in moderate and high resiliency are projected to decrease under all scenarios and timesteps. However, the subspecies is projected to maintain broad occurrence across its range even under the projected future threats, with five of seven representation units containing populations of moderate or high resiliency into the future. Although the total number of populations is projected to decline by 2080, 62 percent of the current range of the Florida pinesnake remains occupied by multiple populations with greater than 80 percent probability of persistence (moderate and high resiliency); therefore, the subspecies is projected to have moderate redundancy, providing the subspecies the ability to withstand catastrophic events. These populations cover a large geographic area and maintain high or moderate resiliency due to adequate suitable habitat coverage, high proportion of area within protected areas, sufficient connectivity, and low impact of threats in the future. Thus, after assessing the best available information, we determine that the Florida pinesnake is not in danger of extinction now or likely to become so within the foreseeable future throughout all of its range.

We also evaluated whether the Florida pinesnake is endangered or threatened in a significant portion of its range. We did not find any portions of the Florida pinesnake's range for which both (1) the portion is significant; and (2) the species is in danger of extinction in that portion either now or in the future. Thus, after assessing the best available information, we conclude that the Florida pinesnake is not in danger of extinction in a significant portion of its range now, or within the foreseeable future.

After assessing the best available information, we concluded that the Florida pinesnake is not in danger of extinction or likely to become in danger of extinction within the foreseeable future throughout all of its range or in any significant portion of its range. Therefore, we find that listing the Florida pinesnake as an endangered species or threatened species under the Act is not warranted. A detailed discussion of the basis for this finding can be found in the Florida pinesnake species assessment form and other supporting documents on *https://www.regulations.gov* under Docket No. FWS–R4–ES–2023–0174 (see **ADDRESSES**, above).

Peer Review

In accordance with our July 1, 1994, peer review policy (59 FR 34270; July 1, 1994) and the Service's August 22, 2016, Director's Memo on the Peer Review Process, we solicited independent scientific reviews of the information contained in the Florida pinesnake SSA report. The Service sent the SSA report to seven independent peer reviewers and received six responses. Results of this structured peer review process can be found at *https://www.regulations.gov.* We incorporated the results of these

reviews, as appropriate, into the SSA report, which is the foundation for this finding.

Mimic Cavesnail

Previous Federal Actions

On June 25, 2007, the Service received a petition from Forest Guardians (*i.e.,* WildEarth Guardians) requesting that the Service list 475 species, including the mimic cavesnail, as endangered or threatened species and designate critical habitat under the Act. All 475 species occur within the Southwestern Region and were ranked as G1 or G1G2 species by NatureServe at the time. On December 16, 2009, the Service published in the **Federal Register** (74 FR 66866) a partial 90-day finding on the mimic cavesnail and 191 other species, stating that the petition presented substantial scientific information indicating that listing may be warranted for 67 of the 192 species, including the mimic cavesnail. This document constitutes our 12-month finding on the 2007 petition to list the mimic cavesnail under the Act.

Summary of Finding

The mimic cavesnail is a freshwater snail endemic to a deep portion of the karstic Edwards Aquifer in Bexar County, Texas. It is a very small snail, with average shell height of about 1.0 millimeter (mm) (0.04 inch (in)), a thin operculum, and trapezoidal radula. Freshwater gastropods are broadly characterized by rapid growth and short lifespans, which result in high reproduction rates and short rates of population turnover. Species may reproduce a single or multiple generations per year.

The range of the mimic cavesnail is situated at the southwestern extent of the San Antonio-New Braunfels metropolitan area in Bexar County, Texas. The distribution of the mimic cavesnail is dependent upon the availability and connectivity of suitable aquatic subterranean habitat; this habitat has sufficient water quality and quantity within deep karstian spaces. Prior to 1986, the mimic cavesnail was known from only two groundwater wells, O.R. Mitchell (State Well Number 6843601) and Verstraeten Wells (State Well Number 6843607). In 2021, the species was discovered at Aldridge 209 Well (State Well Number 6843802), which is 5 km (3 mi) to the southwest of O.R. Mitchell and Verstraeten Wells. All mimic cavesnail wells occur just to the northwest of the freshwater/saline-water interface.

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the mimic cavesnail, and we evaluated all relevant factors under the five listing factors, including any regulatory mechanisms and conservation measures addressing these threats. The primary threats affecting the mimic cavesnail's biological status include mortality from groundwater wells, reductions in groundwater quantity (including reductions via climate change), and groundwater contamination.

After evaluating threats to the species and assessing the cumulative effect of the threats under the Act's section 4(a)(1) factors, we found that well mortality, groundwater quantity, and groundwater contamination are not currently affecting the mimic cavesnail at the population level. Direct mortality through expulsion from groundwater wells is occurring, but the species' benthic lifestyle, high reproductive rate, and short lifespan result in this mortality being unlikely to affect the population's resiliency. In addition, two of the three wells that ejected mimic cavesnails are inactive, which removes those as sources of mortality for the species. Because it is a benthic species, it is less susceptible to entrainment and expulsion from wells, and species with life-history traits like the mimic cavesnail's are unlikely to be affected by the mortality observed at the groundwater wells where it has been found. Further, groundwater quantity at the depths where mimic cavesnail occurs has not been affected by groundwater withdrawals, and we have no information indicating that will change in the future. Finally, we have no evidence of groundwater contamination at these depths. Thus, we conclude that the mimic cavesnail is not in danger of extinction throughout all of its range.

To assess the future conditions of the mimic cavesnail, we evaluated climate change and land-use projections under only the most plausible future scenario from 2022 to 2100. No new wells have been drilled in the immediate area analysis unit since 1995. We assume that this trend will continue and be accompanied by an increase in the capping or plugging of older groundwater wells. We expect that well mortality will decline through 2100.

In the future, the area surrounding mimic cavesnail habitat is projected to have increased human population growth and exurban and suburban development; increased demands for water; and a warming, more drought-prone climate. Climate change will also impact the area, with increasing average and extreme temperatures, but no substantial change in precipitation is expected.With little change in rainfall and increased temperatures, evapotranspiration could increase reducing surface run-off and ultimately aquifer recharge. During drought years, recharge could be reduced by 21–33 percent, and flows at Comal Springs could decrease by 10–24 percent, which would initiate groundwater withdrawal reductions under current State and local regulations. We project that climate change will result in less groundwater extraction from the Edwards Aquifer given existing regulations to protect species listed under the Act in the Comal and San Marcos Springs Systems, as well as limit water withdrawals from the Edwards Aquifer. We would also expect less dependence on groundwater in the future due to ongoing and planned efforts to conserve and augment water resources in the San Antonio-New Braunfels metropolitan area. Given this and historically small declines in water levels, we expect that aquifer levels would not decline and cavesnail habitat would be maintained.

The potential for groundwater contamination in the San Antonio segment will continue into the future. New contaminant sources are expected to be added to the region with increased human populations and expanded development; many existing contaminant sources will persist. There is an ongoing effort by the City of San Antonio to protect sensitive areas of the contributing and recharge zones in Bexar, Medina, and Uvalde Counties. Existing protected lands will potentially aid in reducing transport of contaminants to the San Antonio segment. The mimic cavesnail is also somewhat buffered from the immediate effects of contaminants at least in the near-term future. Deeper portions of that aquifer segment have historically been less impacted by contaminants, but that could change over several decades with increasing urbanization. Furthermore, the San Antonio segment has a great capacity to assimilate and dilute contaminants due to the massive volumes of water transported through the aquifer. The best available information does not allow us to determine whether contaminants would ever reach concentrations that would impair mimic cavesnail habitat. Thus, after assessing the best available information, we conclude that the mimic cavesnail is not likely to become endangered within the foreseeable future throughout all of its range.

We also evaluated whether the mimic cavesnail is endangered or threatened in a significant portion of its range. We did not find any portions of the mimic

cavesnail's range for which both (1) the portion is significant; and (2) the species is in danger of extinction in that portion either now or in the foreseeable future. Thus, after assessing the best available information, we conclude that the mimic cavesnail is not in danger of extinction in a significant portion of its range now, or within the foreseeable future.

After assessing the best available information, we concluded that mimic cavesnail is not in danger of extinction or likely to become in danger of extinction within the foreseeable future throughout all of its range or in any significant portion of its range. Therefore, we find that listing the mimic cavesnail as an endangered species or threatened species under the Act is not warranted. A detailed discussion of the basis for this finding can be found in the mimic cavesnail species assessment form and other supporting documents on *https://www.regulations.gov* under Docket No. FWS–R2–ES–2023–0175 (see **ADDRESSES**, above).

Peer Review

In accordance with our July 1, 1994, peer review policy (59 FR 34270; July 1, 1994) and the Service's August 22, 2016, Director's Memo on the Peer Review Process, we solicited independent scientific reviews of the information contained in the mimic cavesnail SSA report. The Service sent the SSA report to five independent peer reviewers and received two responses. Results of this structured peer review process can be found at *https://www.regulations.gov.* We incorporated the results of these reviews, as appropriate, into the SSA report, which is the foundation for this finding.

Northern Cavefish

Previous Federal Actions

On April 20, 2010, we received a petition from the Center for Biological Diversity, Alabama Rivers Alliance, Clinch Coalition, Dogwood Alliance, Gulf Restoration Network, Tennessee Forests Council, and West Virginia Highlands Conservancy to list 404 aquatic, riparian, and wetland species, including the northern cavefish, as endangered or threatened species under the Act. On September 27, 2011, we published in the **Federal Register** (76 FR 59836) a 90-day finding that the petition contained substantial information indicating listing may be warranted for the northern cavefish. This document constitutes our 12-month finding on the 2010 petition to list the northern cavefish under the Act.

Summary of Finding

Native to central Kentucky, the northern cavefish is a small, cave-dwelling fish found only in subterranean drainages. It is characterized by its rudimentary eyes; lack of skin pigment; large, flat head; and tubular, non-streamlined body. The standard length (tip of nose to end of last vertebra) of adult northern cavefish ranges from approximately 60 to 80 mm (2.4 to 3.1 in). The maximum known age for northern cavefish is 10 years, but the lifespan may be 20 to 40 years. The species has four life stages: egg, protolarva, juvenile, and adult. Eggs and protolarvae are held in the female's gill chamber until reaching the juvenile stage, when they swim freely apart from the mother. Age at reproductive maturity (adulthood) is around 6 years.

Northern cavefish occur in subterranean streams in Meade, Breckinridge, Hardin, Hart, and Edmonson Counties, Kentucky, south of the Ohio River. In Kentucky, this area is characterized as a karst ecosystem with underground drainage systems comprised of sinkholes and caves. The closely related Hoosier cavefish (*Amblyopsis hoosieri*) is restricted to Indiana north of the Ohio River. Formerly, the Hoosier cavefish was recognized as the northern cavefish, but the Hoosier cavefish is now known to be a distinct taxon based on morphological and genetic differences. Because northern cavefish inhabit underground stream networks that cannot be mapped or surveyed, the species likely occurs at sites that are inaccessible, and the true distribution and number of populations within the range of the northern cavefish is unknown.

Individuals of all northern cavefish life stages need generally cool water temperatures, sufficient dissolved oxygen, low salinity, and flowing water. The species needs slow-flowing pools or shoals, a food supply of invertebrates (may occasionally consume other northern cavefish), and substrates composed of fine particles. Floods are important for juveniles and adults as they provide detritus and food resources. At the population level, floods are important for reproduction (renewing generations) and maintaining connectivity, likely allowing passive transport between sites.

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the northern cavefish, and we evaluated all relevant factors under the five listing factors, including any regulatory mechanisms and conservation measures addressing these threats. The primary threats affecting the northern cavefish's biological status include water pollution, agriculture and forest loss, municipal and industrial development, and impoundment of surface waters.

Historically, there were at least six metapopulations (single population with subpopulations at different sites and some connectivity between sites) of northern cavefish. Two of those populations have no records since the 1990s and cannot be confirmed to be extant or extirpated. Based on occurrence records since 2000, the other four northern cavefish metapopulations are known to remain extant in two representation units. The representation units are separated by the Rough Creek Fault Zone, which is likely a barrier to cavefish dispersal. Population resiliency was not directly assessed; however, the number of individuals encountered during surveys of most sites is 20 or fewer, but some sites (subpopulations) have documented hundreds of northern cavefish.

Northern cavefish may be negatively impacted by groundwater contamination via storm runoff or intentional disposal of wastes in sinkholes, which are a predominant landscape feature in the species' range. While there is risk of a spill or surface release of contaminants to groundwater, there have been no documented cases of northern cavefish being harmed by such an event. In addition, it is unlikely contamination events would affect all populations, as the two representation units are separated by a fault zone barrier. Further, there is redundancy of subpopulations within at least two of the four known extant metapopulations (at least one metapopulation in each representation unit has multiple populations). Because there is redundancy of subpopulations within three of the four known, extant metapopulations (at least one metapopulation in each representation unit has multiple subpopulations) there are multiple populations distributed across a wide area (which buffers the impacts of adverse events), the current risk of extinction is low. Therefore, we find that the species is not in danger of extinction throughout all of its range.

Our future conditions analysis for the northern cavefish used projections of land uses and climate to assess potential groundwater contamination and changes in stream discharge and water temperature, respectively, to 30- and 50-year time horizons. It is reasonable to rely on these time horizons because they correspond to the range of available urbanization and land use change model forecasts. Furthermore, approximately

30 and 50 years represent timeframes for the species to respond to potential changes on the landscape. Two scenarios were projected, one under which human population growth and economic development is slow, and another under which such growth and development is more rapid. Climate in the species' range is expected to be warmer and wetter, but is unlikely to be a major threat to the species at the time horizons considered in our analysis. Likewise, under both scenarios and time horizons, the portion of developed land is expected to change very little. Given the projected small changes in threats and land use to 2070, we expect the northern cavefish will maintain species' redundancy and representation similar to current levels. In addition, the best scientific information indicates the species' population conditions have not substantially changed over time and are not expected to change within the foreseeable future given the projected lack of change in land uses and threats. Thus, after assessing the best available information, we conclude that the northern cavefish is not likely to become an endangered species within the foreseeable future throughout all of its range.

We also evaluated whether the northern cavefish is endangered or threatened in a significant portion of its range. We did not find any portions of the northern cavefish's range for which both (1) the portion is significant; and (2) the species is in danger of extinction in that portion either now or within the foreseeable future. Thus, after assessing the best available information, we conclude that the northern cavefish is not in danger of extinction in a significant portion of its range now, or within the foreseeable future.

After assessing the best available information, we concluded that northern cavefish is not in danger of extinction or likely to become in danger of extinction within the foreseeable future throughout all of its range or in any significant portion of its range. Therefore, we find that listing the northern cavefish as an endangered species or threatened species under the Act is not warranted. A detailed discussion of the basis for this finding can be found in the northern cavefish species assessment form and other supporting documents on *https://www.regulations.gov* under Docket No. FWS–R4–ES–2023–0176 (see **ADDRESSES**, above).

Peer Review

In accordance with our July 1, 1994, peer review policy (59 FR 34270; July 1, 1994) and the Service's August 22, 2016, Director's Memo on the Peer Review Process, we solicited independent scientific reviews of the information contained in the northern cavefish SSA report. The Service sent the SSA report to seven independent peer reviewers and received no responses. Although we received no peer review responses, we received input from species experts during development of the SSA, which is incorporated into and cited in the SSA report. Results of this structured peer review process can be found at *https://www.regulations.gov.* We incorporated the results of these reviews, as appropriate, into the SSA report, which is the foundation for this finding.

Smallscale Darter

Previous Federal Actions

On April 20, 2010, we received a petition from the Center for Biological Diversity, Alabama Rivers Alliance, Clinch Coalition, Dogwood Alliance, Gulf Restoration Network, Tennessee Forests Council, and West Virginia Highlands to list 404 aquatic, riparian, and wetland species, including the smallscale darter, as endangered or threatened species under the Act. On September 27, 2011, we published in the **Federal Register** (76 FR 59836) a 90-day finding that the petition contained substantial information indicating listing may be warranted for the smallscale darter. This document constitutes our 12-month finding on the 2010 petition to list the smallscale darter under the Act.

Summary of Finding

The smallscale darter is a member of the Class Actinopterygii (ray-finned fishes), Order Perciformes, Family Percidae (perches), in the subfamily Etheostomatinae (darters). This midsized darter reaches a maximum length of 93 mm (3.6 in). The species is native to the Stones River, Harpeth River, Red River, and Little River tributaries of the Cumberland River System in Kentucky and Tennessee. The Harpeth River and Stones River populations are in the greater Nashville area of Tennessee, while the Little River population is in Kentucky. The Red River population straddles the border of Kentucky and Tennessee. The smallscale darter is extant throughout its historical range.

Stream reaches occupied by smallscale darters tend to have stable banks, intact riparian areas, and clean cobble and boulder substrate. These stream characteristics support the reproduction of smallscale darters, in which females attach eggs under a rock, and males protect the eggs until they hatch. Juveniles may inhabit areas where the current is slower, water is shallower, and substrate is finer than areas inhabited by adults. At the microhabitat level, smallscale darters use deeper and faster flowing parts of riffles than other darters in the species' range.

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the smallscale darter, and we evaluated all relevant factors under the five listing factors, including any regulatory mechanisms and conservation measures addressing these threats. The primary threats affecting the smallscale darter's biological status include habitat destruction and degradation resulting from urbanization, agricultural land use, impoundments, and impaired water quality. We concluded in our analyses that impacts of isolated populations and climate change are not likely to negatively influence the species' viability. The smallscale darter is present throughout its historical range in four populations exhibiting moderate to moderate-high resiliency. This moderate to moderate-high resiliency of smallscale darter populations, combined with the species' presence throughout its historical area, provides moderate redundancy and representation rangewide. Given the moderate to moderate-high resiliency populations distributed across the historical range, the species is not currently in danger of extinction throughout its range. Thus, we find that the species is not in danger of extinction throughout all of its range.

The smallscale darter is expected to maintain at least moderate resiliency across its range for the foreseeable future in all but one scenario for one population. For the smallscale darter, we identified the foreseeable future as 30 years, the time period for which we could reliably predict both relevant land cover change and the species' response to these changes. In all three future scenarios, we project the species to be extant in the entirety of its known range, with moderate resiliency for all populations in two of the three scenarios. We determined that the magnitude and scale of impacts projected in the future will not impact the species such that it is likely to become an endangered species within the foreseeable future. Thus, after assessing the best available information, we conclude that the smallscale darter is not likely to become an endangered species within the foreseeable future throughout all of its range.

We also evaluated whether the smallscale darter is endangered or threatened in a significant portion of its range. We did not find any portions of the smallscale darter's range for which both (1) the portion is significant; and (2) the species is in danger of extinction in that portion either now or within the foreseeable future. Thus, after assessing the best available information, we conclude that the smallscale darter is not in danger of extinction in a significant portion of its range now, or within the foreseeable future.

After assessing the best available information, we concluded that smallscale darter is not in danger of extinction or likely to become in danger of extinction within the foreseeable future throughout all of its range or in any significant portion of its range. Therefore, we find that listing the smallscale darter as an endangered species or threatened species under the Act is not warranted. A detailed discussion of the basis for this finding can be found in the smallscale darter species assessment form and other supporting documents on *https://www.regulations.gov* under Docket No. FWS–R4–ES–2023–0177 (see **ADDRESSES**, above).

Peer Review

In accordance with our July 1, 1994, peer review policy (59 FR 34270; July 1, 1994) and the Service's August 22, 2016, Director's Memo on the Peer Review Process, we solicited independent scientific reviews of the information contained in the smallscale darter SSA report. The Service sent the SSA report to five independent peer reviewers and received three responses. Results of this structured peer review process can be found at *https://www.regulations.gov*. We incorporated the results of these reviews, as appropriate, into the SSA report, which is the foundation for this finding.

Texas Troglobitic Water Slater

Previous Federal Actions

On June 25, 2007, the Service received a petition from Forest Guardians (*i.e.,* WildEarth Guardians) requesting that the Service list 475 species, including the Texas troglobitic water slater, as endangered or threatened species and designate critical habitat under the Act. All 475 species occur within the Southwestern Region and were ranked as G1 or G1G2 species by NatureServe at the time. On December 16, 2009, the Service published in the **Federal Register** (74 FR 66866) a partial 90-day finding on the Texas troglobitic water slater and 191 other species, stating that the petition presented substantial scientific information indicating that listing may be warranted for 67 of the 192 species, including the Texas troglobitic water slater. This document constitutes our 12-month finding on the 2007 petition to list the Texas troglobitic water slater under the Act.

Summary of Finding

The Texas troglobitic water slater is a small, aquatic subterranean crustacean located in the artesian zone of the southern segment (also referred to as the San Antonio segment) of the Edwards Aquifer in Hays County, Texas. Texas troglobitic water slaters are expelled from the artesian zone of the Edwards Aquifer through artesian wells and springs. Because of its primarily non-photosynthetic diet and high well mortality relative to other collected subterranean taxa (which may indicate a longer distance traveled to the surface), the Texas troglobitic water slater likely occupies depths somewhere between 60 m (197 ft) and 152 m (498 ft) below the surface. This species of water slater has been collected from three discharge sites: the San Marcos artesian well, Diversion Spring, and the training area well. These sites are all within 600 m (2,000 ft) of each other and in close proximity (less than approximately 100 m (330 ft)) to the freshwater/saline-water zone of the Edwards Aquifer.

The Texas troglobitic water slater lives in water-filled voids within the aquifer, although the species has never been directly observed in its natural subterranean habitat and, thus, its specific habitat preferences are not known. Observations of congeneric species indicate the capacity for high rates of reproduction and benthic (crawling) movement of the species. Stable isotope data suggest the Texas troglobitic water slater is relatively low on the food web, serving as a benthic forager and/or scraper. The primary type of food consumed by the Texas troglobitic water slater is produced at the freshwater/saline-water interface, which likely necessitates that the species lives within close proximity to this interface.

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the Texas troglobitic water slater, and we evaluated all relevant factors under the five listing factors, including any regulatory mechanisms and conservation measures addressing these threats. The primary threats affecting the Texas troglobitic water slater's biological status include reductions in water quantity through groundwater pumping and development, reductions in water quality, the effects of climate change, and mortality from groundwater wells.

After evaluating threats to the species and assessing the cumulative effect of the threats under the Act's section 4(a)(1) factors, we found that the best available information does not indicate direct negative effects from environmental or anthropogenic factors to the Texas troglobitic water slater population, nor is there evidence indicating a change to demographic factors from historical levels. The primary driving factors of Texas troglobitic water slater viability are water quantity (*e.g.,* groundwater pumping and development) and water quality (*e.g.,* development and impervious cover). The Texas troglobitic water slater has survived significant drought periods (including the drought of record from the late 1940s to mid-1950s) and despite the examined factors, the population has maintained resiliency for more than a century. Additionally, the best available information does not indicate that any groundwater contamination is affecting the species. Finally, direct mortality through expulsion from groundwater wells is occurring, but the species' benthic lifestyle and likely high reproductive rate result in this level of mortality being unlikely to affect the population's current resiliency.

Our two plausible future scenarios for the species use projections out to 2050 and 2100. The primary factors driving the Texas troglobitic water slater population's future viability are water quantity and water quality. Increases in development lead to increases in impervious cover, altered recharge rates, and degraded water quality. The lands directly above Texas troglobitic water slater habitat are categorized as developed, and all anthropogenic factors already exist and will continue to influence the species' viability into the future. Projected land-use changes occurring over the recharge zone will also inhibit opportunities for surface water to enter the aquifer and for enough discharging water to effectively clear anthropogenic contaminants. Longer residence times of contaminants in groundwater and lack of photodegradation of constituents in the aquifer are not well understood, and it is uncertain how these changes will affect the Texas troglobitic water slater population into the future. There is no information assessing the environmental tolerance of the Texas troglobitic water slater or how degradation in water

quality can affect the species. Likewise, at this time, there are no appropriate isopod surrogates occupying a similar habitat with more information from which we could extrapolate for the Texas troglobitic water slater.

While climate change and other anthropogenic influences (*e.g.,* vegetation removal and urbanization) cause the surface to warm, a lag in increased groundwater temperature may occur. For ectothermic animals like the Texas troglobitic water slater, overall vulnerability to climate change will depend on thermal sensitivity and how quickly the buffered environment changes, and we do not have this information to inform our future scenarios. The southern segment of the Edwards Aquifer has a great capacity to assimilate and dilute contaminants as massive volumes of water transport these materials through the aquifer. However, contaminants in groundwater can be diluted over distance and time and flushed through discharge points more frequently than older groundwater at a greater depth. We have no information indicating whether contaminants would ever reach concentrations that would impair or kill Texas troglobitic water slaters in either scenario.

Current water planning does not account for climate change, although climate change will be considered in the upcoming Edwards Aquifer Habitat Conservation Plan (HCP). There remains a possibility that current State and local regulations on groundwater use may not be enough to maintain aquifer levels and springflows if conditions become worse than the drought of record. The Edwards Aquifer Authority is committed to improving their HCP, and funding was allocated to predict droughts and climate change impacts on the aquifer. Land in Hays County over the recharge zone was purchased or protected through easements, and partners are committed to purchasing more land in the future, in addition to implementing other conservation efforts. If current management of the southern segment of the Edwards Aquifer continues into the future, aquifer levels should not decline to a level where Texas troglobitic water slater habitat would not be maintained.

For both the lower and upper plausible future scenarios, the best available information does not project a negative impact from environmental or anthropogenic factors directly to the known Texas troglobitic water slater population at the depth at which they occur, nor is there evidence indicating a negative change to demographic factors historically. We expect that under both future scenarios, resiliency, redundancy, and representation of the species will be maintained into the foreseeable future. Neither future scenario projections point to evidence indicating any threat to the Texas troglobitic water slater population under current groundwater management implementation, which we anticipate will continue into the future. Thus, after assessing the best available information, we conclude that the Texas troglobitic water slater is not in danger of extinction or likely to become in danger of extinction within the foreseeable future throughout all of its range.

We also evaluated whether the Texas troglobitic water slater is endangered or threatened in a significant portion of its range. We did not find any portions of the Texas troglobitic water slater's range for which both (1) the portion is significant; and (2) the species is in danger of extinction in that portion either now or in the foreseeable future. Thus, after assessing the best available information, we conclude that the Texas troglobitic water slater is not in danger of extinction in a significant portion of its range now, or within the foreseeable future.

After assessing the best available information, we concluded that Texas troglobitic water slater is not in danger of extinction or likely to become in danger of extinction within the foreseeable future throughout all of its range or in any significant portion of its range. Therefore, we find that listing the Texas troglobitic water slater as an endangered species or threatened species under the Act is not warranted. A detailed discussion of the basis for this finding can be found in the Texas troglobitic water slater species assessment form and other supporting documents on *https://www.regulations.gov* under Docket No. FWS–R2–ES–2023–0178 (see **ADDRESSES**, above).

Peer Review

In accordance with our July 1, 1994, peer review policy (59 FR 34270; July 1, 1994) and the Service's August 22, 2016, Director's Memo on the Peer Review Process, we solicited independent scientific reviews of the information contained in the Texas troglobitic water slater SSA report. The Service sent the SSA report to three independent peer reviewers and received two responses. Results of this structured peer review process can be found at *https://www.regulations.gov.* We incorporated the results of these reviews, as appropriate, into the SSA report, which is the foundation for this finding.

New Information

We request that you submit any new information concerning the taxonomy of, biology of, ecology of, status of, or stressors to the Edison's ascyrum, Florida (lowland) loosestrife, Florida pinesnake, mimic cavesnail, northern cavefish, smallscale darter, or Texas troglobitic water slater to the appropriate person, as specified under **FOR FURTHER INFORMATION CONTACT**, whenever it becomes available. New information will help us monitor these species and make appropriate decisions about their conservation and status. We encourage local agencies and stakeholders to continue cooperative monitoring and conservation efforts.

References

A complete list of the references used in these petition findings is available in the relevant species assessment form, which is available on the internet at *https://www.regulations.gov* in the appropriate docket (see **ADDRESSES**, above) and upon request from the appropriate person (see **FOR FURTHER INFORMATION CONTACT**, above).

Authors

The primary authors of this document are the staff members of the Species Assessment Team, Ecological Services Program.

Authority

The authority for this action is section 4 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Martha Williams,

Director, U.S. Fish and Wildlife Service.

[FR Doc. 2023–25586 Filed 11–28–23; 8:45 am]

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Appendix D4 | **Notification of Lifting of Condition M in Comal River**

EDWARDS AQUIFER
AUTHORITY

May 25, 2023

Ms. Karen Myers
Field Supervisor
Austin Ecological Services Field Office
U.S. Fish and Wildlife Service
1505 Ferguson Lane
Austin, Texas 78754

RE: Comal River - Conclusion of Condition M Implementation (Permit TE63663A-1)

Dear Ms. Myers:

This letter is to inform you that the Permittees of the Edwards Aquifer Habitat Conservation Program (EAHCP) Incidental Take Permit Number (ITP) TE63663A-1, have concluded the Condition M restoration restrictions in the Comal spring system implemented on June 17, 2022.

On May 22, 2023, the U.S. Geological Survey (#08169000) flow gage in the Comal River in New Braunfels, TX recorded discharge above 130 cfs. Since then, spring discharge has continued to increase and stabilize above the 130 cfs trigger. Based on recent rainfall, the limitations on habitat mitigation and restoration measures activated by Condition M of the ITP have concluded and implementation of those restrictions will no longer be required.

As flow levels persist above the springflow trigger, EAHCP contractors will resume aquatic and riparian restoration activities as scheduled and continue to monitor springflow discharge.

Please let me know if you have any questions.

Sincerely,

Scott D. Storment
Program Manager
Edwards Aquifer Habitat Conservation Plan

Appendix D5 | **Notification of Implementation of Condition M Restrictions in Comal River**

EDWARDS AQUIFER AUTHORITY

July 25, 2023

Ms. Karen Myers
Field Supervisor
Austin Ecological Services Field Office
U.S. Fish and Wildlife Service
1505 Ferguson Lane
Austin, Texas 78754

RE: Comal River - Implementation of Condition M of Permit TE63663A-1

Dear Ms. Myers:

This letter is to inform you that the Permittees of the Edwards Aquifer Habitat Conservation Program (EAHCP) Incidental Take Permit, Number TE63663A-1 (ITP), have reduced and suspended aquatic and riparian restoration activities as required by Condition M of the ITP in the Comal River system.

On July 5, 2023, the USGS flow gauge #081690000 Comal River at New Braunfels, Texas recorded a discharge of less than 130 cfs. Since then, the flow continues to decline. Based on these low flow conditions, habitat mitigation and restoration activities have been reduced to limit the disturbance of the substrate, water quality, plants, animals and invertebrates.

In 2014, the USFWS approved a clarification to the terms of Condition M and authorized the continuance of specific activities that may be implemented during low flow conditions. These covered measures and USFWS-approved activities are attached as Exhibit 1. Measures missing from the clarification table, such as riparian restoration, etc., will assume the original interpretation of Condition M as stated in the ITP.

As low flows persist, biological and water quality monitoring activities will be conducted to determine habitat availability and impacts to the Covered Species. Aquatic and riparian restoration restrictions will continue until the Comal River flow increases and stabilizes above the 130 cfs low flow trigger.

Please let me know if you have any questions.

Sincerely,

Scott D. Storment (Jul 25, 2023 15:32 CDT)

Scott D. Storment
EAHCP Program Manager

EXHIBIT 1

Comal Conservation Measures	Interpretation	Specific activities that may continue at all flows
Management of river flow between old and new channels of the Comal River (Section 5.2.1)	The actual management of the flow that is split between the New Channel and the Old Channel is designed to minimize and mitigate the impacts of incidental take in reduced flow conditions.	Manipulation of gates in accordance with the City of New Braunfels flow-split system standard operating procedures to be in accordance with EAHCP Table 5.3.
Restoration and maintenance of native aquatic vegetation (Section 5.2.2)	Maintenance of native aquatic vegetation includes gardening to increase preferred fountain darter habitat during reduced flow conditions.	Gardening, such as removal of non-native vegetation, in previously restored areas such as in the Old Channel and Landa Lake. Extra precautions, such as minimizing the number of gardeners in water, working from downstream to upstream and not tilling the substrate to remove vegetation will be employed to reduce disturbance of sediment.
Management of public recreational use (Section 5.2.3)	Continuing management of public recreation areas assures minimal impact and disturbance from recreational users.	Printing and distribution of educational materials, signage, and workshops.
Removal of decaying vegetation and dissolved oxygen management (Section 5.2.4)	The removal of the vegetative mats and the implementation of a dissolved oxygen management program helps to maintain healthy, preferred fountain darter habitat during reduced flows.	Gardening, such as the removal of decaying vegetation by working from a flat-bottom boat or kayak when practical, minimizing the number of workers in the water and working upstream to downstream to limit increased disturbance, such as pushing floating vegetative mats downstream.
Management of harmful non-native animal species (Sections 5.2.5 and 5.2.9)	Low flow conditions reduce the area that non-native fish have, making it easier to spear or net them. Greater numbers will be removed from the system at a time when they are most likely to cause damage.	Spear and bow fishing of non-native animals.
Prohibition of hazardous material transport (Section 5.2.7)	Not conducted in the aquatic ecosystem.	No further detail needed.

Comal Conservation Measures	Interpretation	Specific activities that may continue at all flows
Live bait prohibition (Section 5.2.9)	Not conducted in the aquatic ecosystem.	No further detail needed.
Litter collection and floating vegetation management (Section 5.2.10)	The removal of litter and removal of floating vegetation management has a positive effect on the system by helping to maintain habitat with a very limited impact on the substrate.	Removal of floating vegetation and litter by working from a barge, flatbottom boat or kayak when practical, with a minimum number of workers in the water that limits increased disturbance, such as pushing floating vegetative mats downstream. All areas for maintenance will be represented in vegetation maps.
Management of golf course diversions and operations (Section 5.2.11)	Continued planning and management of the Golf Course assures minimal impact or disturbance of the aquatic ecosystem.	No further detail needed.
Management of household hazardous wastes (Section 5.7.5)	Management of household, hazardous wastes is a terrestrial activity.	No further detail needed.

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Final Audit Report 2023-07-25

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By:	Olivia Ybarra (oybarra@edwardsaquifer.org)
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Appendix D6 | **Notification of 2024 VISPO Forbearance Payments**

EDWARDS AQUIFER AUTHORITY
MANAGE • ENHANCE • PROTECT

October 9, 2023

Ms. Karen Myers
Field Supervisor
U.S. Fish and Wildlife Service
1505 Ferguson Ln.
Austin, TX 78754

RE: Informational Memorandum regarding the Edwards Aquifer Habitat Conservation Plan Voluntary Irrigation Suspension Program Option Forbearance Agreement.

Dear Ms. Myers:

This letter is submitted on behalf of the City of New Braunfels (CONB), the City of San Marcos (COSM), the Edwards Aquifer Authority (EAA), the San Antonio Water System (SAWS), and Texas State University (collectively the Permittees of Incidental Take Permit (ITP) (TE63663A-1)) to inform the U.S. Fish and Wildlife Service on the implementation of the Voluntary Irrigation Suspension Program Option (VISPO) springflow protection measure as discussed in Section 5.5.1 of the Edwards Aquifer Habitat Conservation Plan (EAHCP).

The purpose of VISPO is to allow Edwards Aquifer Authority groundwater permit holders participating in the program to be financially compensated to suspend withdrawal of enrolled water during low springflow conditions. If the J-17 index well in San Antonio is at or below 635 feet above mean sea level (msl) on October 1, VISPO participants are required to suspend use of their enrolled water for the entire calendar year that follows, beginning January 1.

On October 1, 2023, the J-17 index well was at 630.3 feet above msl. Therefore, beginning on January 1, 2024, VISPO participants are required to suspend withdrawals of enrolled water for the amounts agreed upon in their individual agreements.

If aquifer conditions improve dramatically, and J-17 is above 660 feet msl on January 1, 2024, VISPO participants will have the option to not forbear the enrolled water. However, participants will forgo any payments for forbearance and the enrolled water will be subject to any Critical Period reductions in effect for 2024.

Kind regards,

Scott D. Storment

Scott D. Storment (Oct 9, 2023 15:35 CDT)

Scott D. Storment
Program Manager
Edwards Aquifer Habitat Conservation Plan

Informational Memo_USFWS_VISPO_FINAL_10.09.2023

Final Audit Report 2023-10-09

Created:	2023-10-09
By:	Olivia Ybarra (oybarra@edwardsaquifer.org)
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Appendix D7 | **EAA's Comments on USFWS's Proposed Rule for the Blindcats**

EDWARDS AQUIFER AUTHORITY

October 19, 2023

Public Comments Processing
Attn: FWS-R2-ES-2023-0069
U.S. Fish and Wildlife Service, MS:PRB/3W, 5275
Leesburg Pike, Falls Church, VA 22041-3803

Re: Comments on the Proposed Listing of the Widemouth Blindcat and the Toothless Blindcat cavefish species under the Endangered Species Act of 1973 (Docket No. FWS-R2-ES-2023-0069)

Director Williams:

The Edwards Aquifer Authority (EAA) has reviewed the scientific evidence referenced by the U.S. Fish and Wildlife Service (USFWS) in the proposed listing of two blind catfish species located in the deep, confined sections of the Edwards Aquifer and concludes that the justification presented for the proposed listing has substantial technical weaknesses that make listing the species at this time premature and without a rational basis. The EAA respectfully submits the following comments on the Species Status Assessment ("SSA"), which was used by USFWS to support the proposed listing of the species as endangered:

- The SSA states that the spatial configuration of the catfish habitat is not known due to the inaccessible nature of the deep aquifer; however, an analysis that is the primary framework for the proposed listing uses mortality and population dynamics based exclusively on assumptions that include the spatial distribution being known. Since few Edwards Aquifer locations have been used to provide information on the existence of the species, and temporal documentation of species occurrence is sparse, it would appear that an accurate analysis of the mortality impact of relatively few wells within the expansive Immediate Area Analysis Unit ("Analysis Unit") cannot be made at this time. The SSA presents no other possible scenarios that may or may not support listing the species as endangered.

- The SSA fails to consider the karstic nature of the Edwards Aquifer and the importance to the species as a result thereof. As stated above, the approximate area of the Analysis Unit is quite large, and there is a low probability that any given well will intercept a void, conduit, or enlarged fracture, even in a prolific karst aquifer such as the Edwards. Thus, there is a very low chance for a well to encounter porosity/permeability with conduits or fractures that are large enough to provide likely habitat zones for blind catfish. It is also unlikely that a single, large, integrated habitat zone exists in the deep artesian zone of the Edwards Aquifer; therefore, the few wells that do intersect localized populations of catfish may not affect the other areas where the species exist.

- A linear decay rate for mortality, as proposed by USFWS, assumes that there is a constant source of individuals—even though the population size in the vicinity of any single well (that impacts the catfish) is diminished over time. Thus, it seems unlikely that the rate of mortality could be constant over a long period of time as assumed in the SSA analysis. Since no additional drilling of wells or additional pumping from the Analysis Unit has occurred in recent decades, it seems possible that the population may have reached some sort of equilibrium, with other isolated localized habitats not impacted because no well(s) intersect those habitats.

- An assumption that populations have decreased continually from when pumping was active in all the known habitat wells appears to be inconsistent with actual conditions in the Aquifer. Only 3 of 11 groundwater wells where either or both species have historically been observed are active today. That reflects a 73% reduction in pumping from directly observed habitat. This fact is not addressed in the document but seems significant in describing existing threats. Previous statements in the document claim that wells where pumping has ceased can lead to population rebounds. As 73% of the known habitat wells no longer create threats to either species, population numbers should have increased over time in those areas.

- An analysis of well completion details, vertical hydrogeologic conditions, and current well use status is absent from the SSA. In fact, there was no inclusion of data specific to the completion of wells that have produced specimens of catfish in comparison to wells that have not produced specimens. The geologic and engineering specifications of any single well likely control the well's ability to intercept catfish habitat and transmit partial or complete specimens to the surface.

The EAA intends to continue to share information regarding the hydrogeologic construct of the Edwards Aquifer and specific well information within the areas defined in the SSA to better inform USFWS of existing conditions with the hope of avoiding a premature and erroneous listing of the two blind catfish species. In addition, as the Edwards Aquifer Habitat Conservation Plan continues through its renewal process, the EAA intends to keep USFWS informed of the uncertainties and significant negative impacts the potential listings create in relation to the plan's existing conservation measures. If you have any questions regarding these comments, please contact Mr. Marc Friberg, Deputy General Manager, at 210-477-8522.

Sincerely,

Roland Ruiz
General Manager

Appendix D8 | **SAWS's Comments on USFWS's Proposed Rule for the Blindcats**

Edward F. Guzman
Vice President | Environmental Law & Regulatory Compliance
Edward.Guzman@saws.org | Direct Line 210.233.3858

October 23, 2023

Submitted electronically at **https://www.regulations.gov**

Public Comments Processing
U.S. Fish and Wildlife Service, MS: PRB/3W
5275 Leesburg Pike, Falls Church, VA 22041–3803
Attention: Martha Williams, Director

Re: FWS–R2–ES–2023–0069
Endangered and Threatened Wildlife and Plants; Endangered Species Status for Toothless Blindcat and Widemouth Blindcat, 88 Fed. Reg. 57,046 (August 22, 2023)

Dear Director Williams:

The San Antonio Water System ("SAWS") appreciates this opportunity to submit the following comments in response to the August 22, 2023, proposed rule and request for comment from the U.S. Fish and Wildlife Service ("USFWS") to list the toothless blindcat and widemouth blindcat (together, the "Blindcats") as endangered under the Endangered Species Act of 1973, as amended ("ESA"). 88 Fed. Reg. 57,046 (August 22, 2023) ("Proposal"). We also provide herein comments on the Species Status Assessment ("SSA") for the Blindcats (USFWS 2022). As you know, we have previously requested an extension of the comment period on the Proposal (see Attachment A). Given that USFWS has not as of our submission of these comments extended the comment period, please consider our request for extension as a request for reopening of the comment period. Consistent with USFWS guidance provided during a meeting between SAWS, the Edwards Aquifer Authority ("EAA") and local USFWS personnel, as soon as practicable, SAWS intends to provide data and analysis supplementary to this letter.

In the Proposal, which relies on the analysis in the SSA, USFWS sets forth its determination that the sole threat warranting listing of the Blindcats is groundwater withdrawal from deep artesian wells within the Edwards Aquifer. 88 Fed. Reg. at 57,046. However, as more fully described below, the Proposal represents a scientifically unsupported reversal of prior USFWS determinations relative to the Blindcats and is based on insufficient and/or inaccurate information to support the proposed listing of these species. Therefore, listing the Blindcats in accordance with the Proposal would violate the procedural and substantive requirements of the ESA and would fail as being an arbitrary and capricious agency action prohibited by the federal Administrative Procedure Act ("APA"). Moreover, USFWS has failed to comply with its *Policy*

for Evaluation of Conservation Efforts When Making Listing Decisions, 68 Fed. Reg. 15,100 (Mar. 28, 2003) ("Policy"). For these reasons, we respectfully request that USFWS withdraw its Proposal and issue a "not warranted" "12-month finding" on the 2007 petition to list the Blindcats. In that way, USFWS can close its consideration of the 2007 petition, which provided no new basis for USFWS to reverse its longstanding position on the Blindcats and, in any event, is now far too old and unsubstantial to merit further action by USFWS.

Following, we will describe in detail several key points that need to be considered by USFWS in making a final determination regarding the Proposal:

- The conclusions by USFWS are based almost entirely on assumptions, estimates and hypotheticals, often based on non-similar species.

- USFWS appears to not understand key aspects of the aquifer's hydrology and the interaction with pumping activities.

- There is a significant lack of information about the population size and habitat of the Blindcats that is essential to drawing further conclusions about the species and any threats they may, or may not, face.

- There is a significant lack of understanding of the technical aspects of SAWS groundwater wells, and specifically those under artesian pressure, leading the Service to erroneously conclude that groundwater wells pose a threat to Blindcats.

- The potential impacts of the Proposal are enormous and may severely impact the provision of water to SAWS customers, requiring an entire revamping of several areas of SAWS service area costing billions of dollars.

- The Proposal may also significantly impact the reliability of necessary water supply to major electrical plants that provide electricity to SAWS customers, downtown hotels, businesses, major tourist attractions in the area, hospitals and schools.

- Listing the Blindcats could also undermine the Edwards Aquifer Habitat Conservation Plan ("EAHCP"), which covers 11 aquifer species and provides collateral conservation benefits to many others.

For these reasons, and as more particularly laid out below, USFWS should withdraw its Proposal.

I. Legal Context

The ESA defines an "endangered species" as "any species which is in danger of extinction throughout all or a significant portion of its range[.]" 16 U.S.C. § 1532(6). Under the ESA, USFWS is required to consider five factors when making a listing determination. 16 U.S.C. §

1533(a)(1)(A)-(E). These include: (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. 16 U.S.C. § 1533(a)(1)(A)-(E). In so doing, USFWS is required to make listing determinations "solely on the basis of the best scientific and commercial data available" after considering other efforts, if any, made by a political subdivision of a state to protect the subject species. 16 U.S.C. § 1533(b)(1)(A). SAWS is an agency of the City of San Antonio, and thus a government entity, and a public water system providing vital services to over two million people.

A. Review under the Administrative Procedure Act

A listing decision is agency action subject to review under the APA and must be set aside if the determination is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with the law." *Am. Wildlands v. Kempthorne*, 530 F.3d 991, 997 (D.C. Cir. 2008) (citing 5 U.S.C. § 706(2)(A)). Where the agency has "relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise," the agency action is arbitrary and capricious. *Am. Stewards of Liberty v. DOI*, 370 F. Supp. 3d 711, 724 (W. D. Tex. – Austin Division, 2019) (where USFWS's failure to delist the bone cave harvestman was arbitrary and capricious when it did not consider available, substantial scientific and commercial information). A reviewing court is tasked with considering "whether the agency acted within the scope of its authority, whether the agency adequately explained its decision, and whether the agency based its decision on the facts in the record, whether the agency considered the relevant factors." *Moden v. U.S. Fish & Wildlife Serv.*, 281 F. Supp. 2d 1193, 1201 (D. Or. 2003) (finding that USFWS acted arbitrarily and capriciously when denying a petition to delist the Lost River and shortnose sucker fishes where substantial information had been presented by plaintiffs in support of the petition and USFWS did not adequately explain its findings).

There is under the ESA no substantive presumption in favor of a species and USFWS may not employ a "precautionary principle" in listing decisions. *See Me. Lobstermen's Ass'n v. Nat'l Marine Fisheries Serv.*, 70 F. 4th 582, 595-96 (D.C. Cir. 2023). As the D.C. Circuit Court of Appeals clearly stated in *Me. Lobstermen*, "Here, the Service misconceived the law, wrongly claiming the legislative history of the ESA had ordained—if legislative history could ever ordain—a precautionary principle in favor of the species." *Id.* at 597-98. The Court went on to state that, "[b]esides, when the Congress wants an agency to apply a precautionary principle, it says so." *Id.* at 599.

It is also improper for USFWS to employ a "worst case analysis" where scientific data is lacking. *Huls Am. Inc. v. Browner*, 83 F.3d 445, 452 (D.C. Cir. 1996); *Me. Lobstermen's Ass'n v. Nat'l Marine Fisheries Serv.*, 70 F. 4th at 596 (citing *Robertson v. Methow Valley Citizens Council,* 490 U.S. 332, 356 (1989) and describing how section 7 of the ESA does not require a distortion of the decision-making process by "overemphasizing highly speculative harm"). The requirement

that the agency rely on the "best scientific and commercial data available" therefore protects against the ESA being "implemented haphazardly, on the basis of speculation or surmise" or as a result of "agency officials zealously but unintelligently pursuing their environmental objectives." *Me. Lobstermen's Ass'n*, 70 F. 4th at 595 (citing *Bennett v. Spear*, 520 U.S. 154, 176-77 (1997)). Where an agency "entirely fails to consider an important aspect of the problem", the agency's decision may be arbitrary and capricious. *San Luis & Delta-Mendota Water Auth. v. Jewell*, 747 F.3d 581, 636 (9th Cir. 2014) (quoting *Motor Vehicle Mfrs. Ass'n of U.S. Inc. v. State Farm Mut. Auto Ins. Co.*, 463 U.S. 29, 43 (1983)). Conversely, agency action may also be arbitrary and capricious where the agency relies on factors beyond those intended. *See, e.g., Alabama-Tombigbee Rivers Coalition v. Kempthorne*, 477 F.3d 1250, 1254 (11th Cir. 2007) (quoting *Motor Vehicle Mfrs. Ass'n of U.S. Inc. v. State Farm Mut. Auto Ins. Co.*, 463 U.S. 29, 43 (1983)).

B. Policy for Evaluation of Conservation Efforts (PECE Policy)

Listing of the Blindcats pursuant to the Proposal will also fail because of USFWS's failure to comply with the PECE Policy, which was specifically adopted by USFWS to aide its decision-making about species listings in light of other conservation efforts. *See*, *e.g.*, *Defenders of Wildlife v. Jewell,* 815 F.3d 1, 4 (D.C. Cir. 2016) (where the appropriateness of USFWS's choice to withdraw a listing proposal turned on the status and nature of state-level conservation efforts taking place and the court stated, "The Service adopted the [Policy] to assist it in making predictive evaluations about the persistence of a species where there are formalized conservation efforts that have not yet been implemented or have been implemented, but have not yet demonstrated whether they are effective at the time of a listing decision." (internal quotations omitted)). In the context of listing species, the Policy "ensure[s] consistent and adequate evaluation of recently formalized conservation efforts" by considering the likelihood that the effort will achieve the desired outcomes of reducing threats to a species. *Id.* at 4 (describing the purpose of the Policy in "identifying criteria for assessing whether such an effort provides a high level of certainty that the effort will be implemented and/or effective and results in the elimination or adequate reduction of the threats posed to any species being considered for a listing." (internal quotations omitted)). Whether a conservation effort is on schedule, meets its objectives, is modified to adapt to changed circumstances, or new information is discovered, are all important factors to consider when making a listing decision in light of an existing conservation effort. *Id.*

II. About SAWS

As you know, central to SAWS's mission is providing sufficient, clean drinking water to a community of over two million people. To accomplish this, SAWS and the larger community depend upon water from the Edwards Aquifer, which is one of the largest artesian aquifers in the world. We are and have been for many years keenly aware that the Edwards Aquifer provides habitat for numerous species listed or under consideration for listing under the ESA. Those species include the Blindcats, which are known only from specimens found in water drawn from wells accessing the deep aquifer.

As we will detail below, SAWS has long been a leader and partner in protecting rare species dependent upon the aquifer. SAWS's species conservation initiatives include assisting in the development and joint implementation of the Edwards Aquifer Habitat Conservation Plan ("EAHCP"). In fact, SAWS's Aquifer Storage and Recovery ("ASR") program, located at the H2Oaks Center, is the key conservation element of the EAHCP. In addition, SAWS H2Oaks Center is the only known place in the country that maximizes efficiency by providing three different sources of water from one site, including desalinated brackish water, Edwards Aquifer water stored in the ASR, and Carrizo Aquifer water. SAWS also successfully developed the public-private Vista Ridge water pipeline project to provide additional non-Edwards Aquifer water to the San Antonio region. SAWS has also expended millions of dollars in the study and monitoring of the Edwards Aquifer and the species which depend upon it. Moreover, SAWS has not limited its conservation actions to Edwards Aquifer species. For example, SAWS successfully developed an ESA habitat conservation plan for a terrestrial karst invertebrate potentially affected by the Anderson/Micron water transmission line. Under that plan, SAWS created a substantial preserve of over 57 acres for endangered and rare karst invertebrates. Additionally, SAWS is currently seeking a water permit to allow SAWS to dedicate 50,000 acre feet of treated wastewater effluent solely for instream flow purposes to the San Antonio and Guadalupe river basins.

It should also be noted, and given due consideration by USFWS, that as described below, 8 of the 11 wells (73%) known in the past to occasionally discharge Blindcats have been capped and are no longer in use. Indeed, over the many decades during which the Blindcats have been of interest to USFWS, well closure , significant controls on pumping of the aquifer, the establishment of non-Edwards sources of water such as through the Vista Ridge Pipeline, and SAWS's ASR program, the potential threats thought to exist by USFWS to the Blindcats would have been significantly reduced and there is no new information sufficient upon which to reverse USFWS's prior determinations that there is insufficient data upon which to base a listing. In fact, USFWS's Proposal represents a dramatic change in the positions it has taken on the Blindcats for several decades, and a close review of the record reveals no sufficient basis for that reversal.

We note that it is also clear from the Proposal that USFWS does not have a sufficient understanding of how the wells actually work and has made assumptions about how the wells might injure or kill Blindcats that are, in fact, inconsistent with the actual functioning of the wells. Therefore, we also include in these comments a summary and diagrams of how a typical deep Edwards Aquifer well functions. This information makes it clear that such wells are not the threat USFWS perceives them to be.

A. How do SAWS wells work?

At some SAWS facilities Edwards Aquifer water enters the casing of typical public supply wells as a result of artesian pressure. The pumps are appropriately set below the artesian pressure derived water level of the aquifer, so the water enters the casing under natural pressure. When required to run, the pump moves water from inside the casing into the tank, then new water replaces the water removed to continue the process. This is occurring at approximately 500 feet (ft) above the described preferred habitat of the Blindcats, which is assumed to be at a depth of 308 meters (m) or 1,010 ft or greater. The drilled portion of the aquifer is tapered down to a smaller size of

the unconfined opening/cased zone of the well construction. The resulting borehole through the confined artesian depth of the aquifer is an infinitesimally small area compared to the overall potential habitat of the Blindcats. A diagram depicting how a typical SAWS public supply well works is provided below as Figure 1. An illustration of artesian pressure and artesian flow is shown in Figure 2. An illustration of a Typical Cross-Section of the Edwards Aquifer is provided below as Figure 3, and a representative depiction of a karst formation is provided below as Figure 4.

Figure 1. Typical SAWS public supply well.

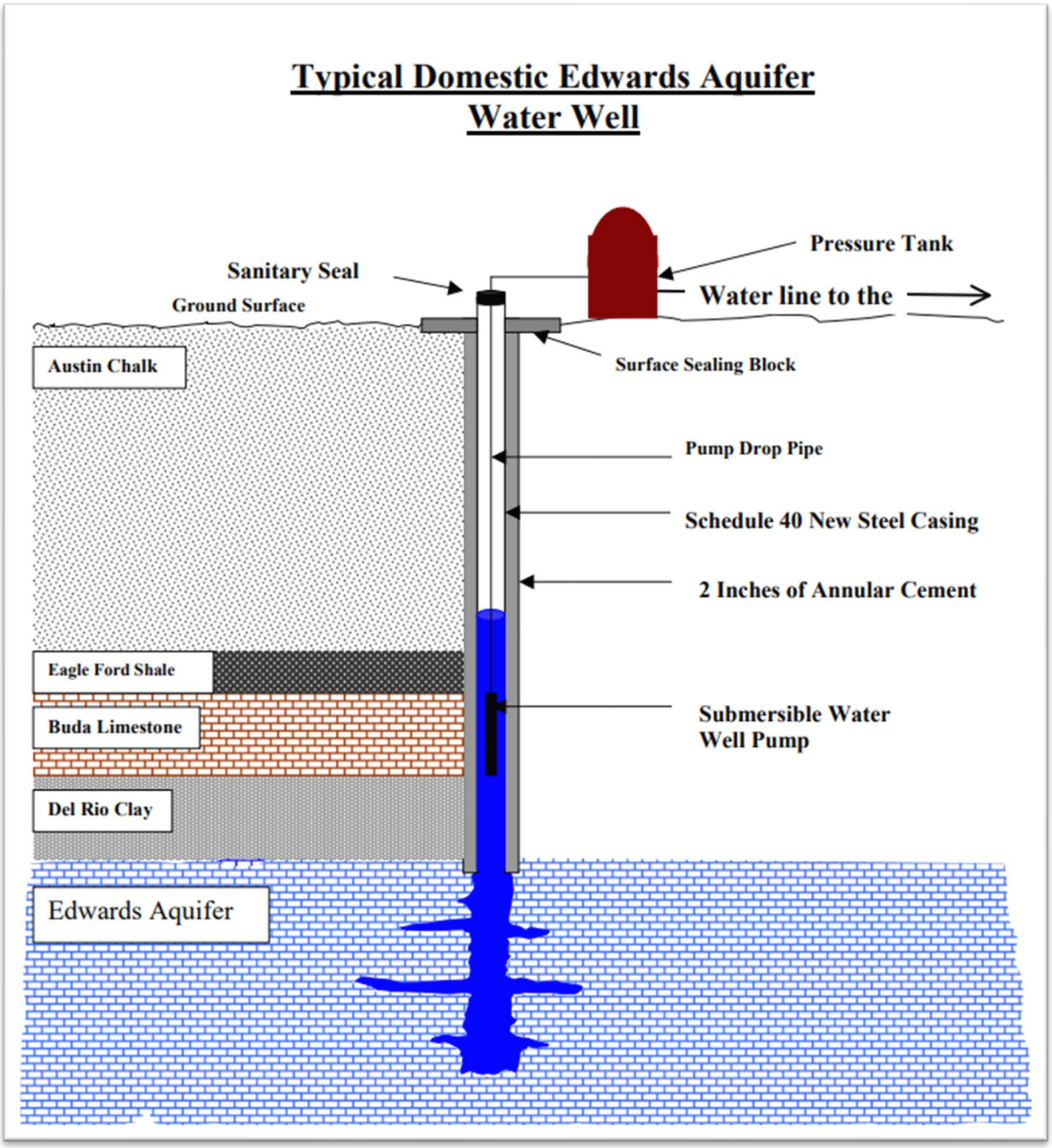


Figure 2. Geological and topographical controls affecting artesian and flowing artesian wells. (USGS Website: Artesian Water and Artesian Wells)

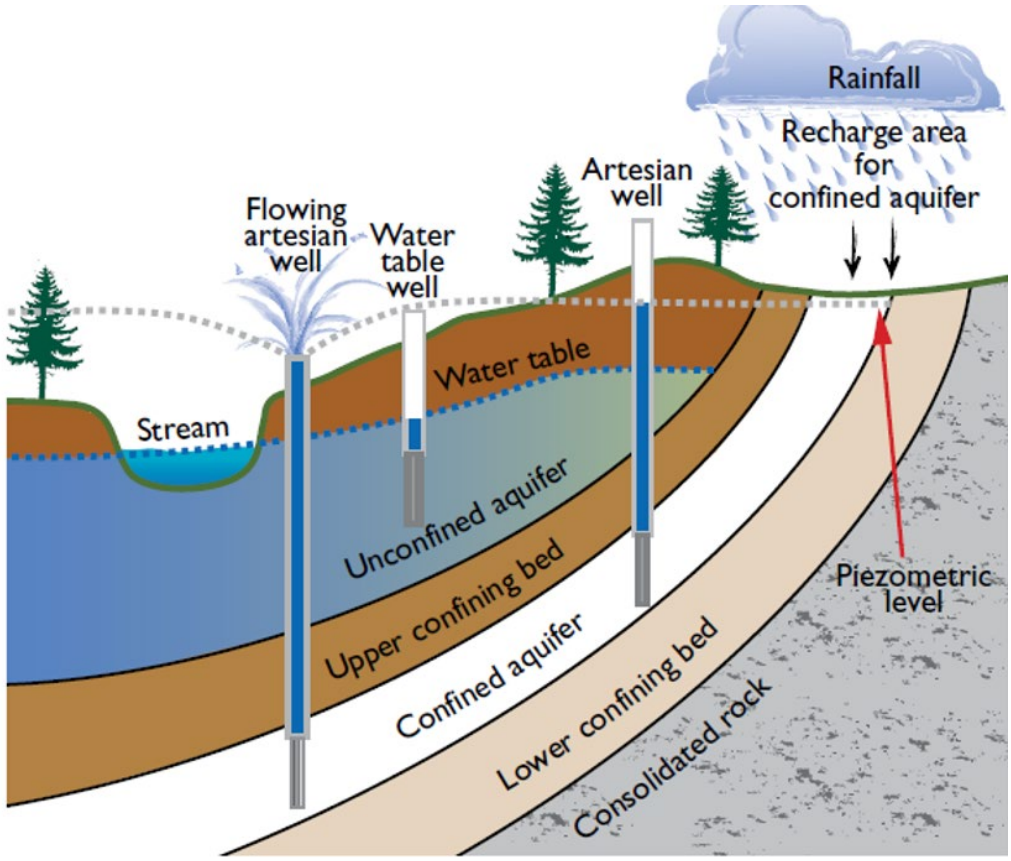


Figure 3. Typical Cross-Section of the Edwards Aquifer

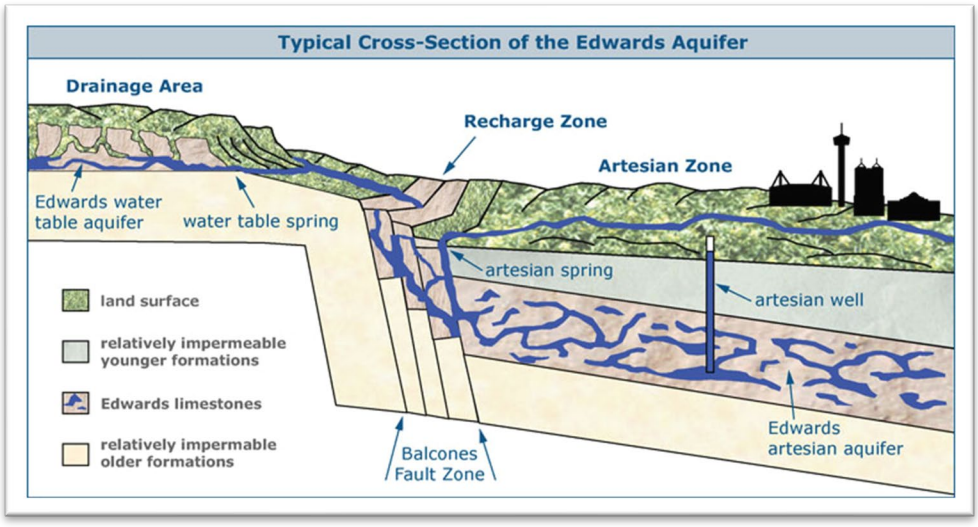
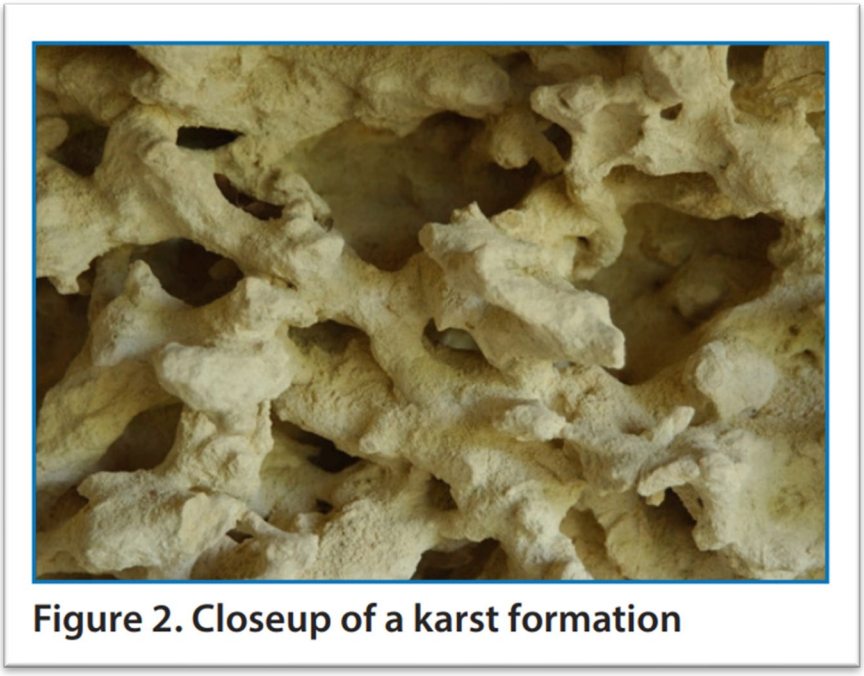


Figure 4. Representative depiction of a karst formation.

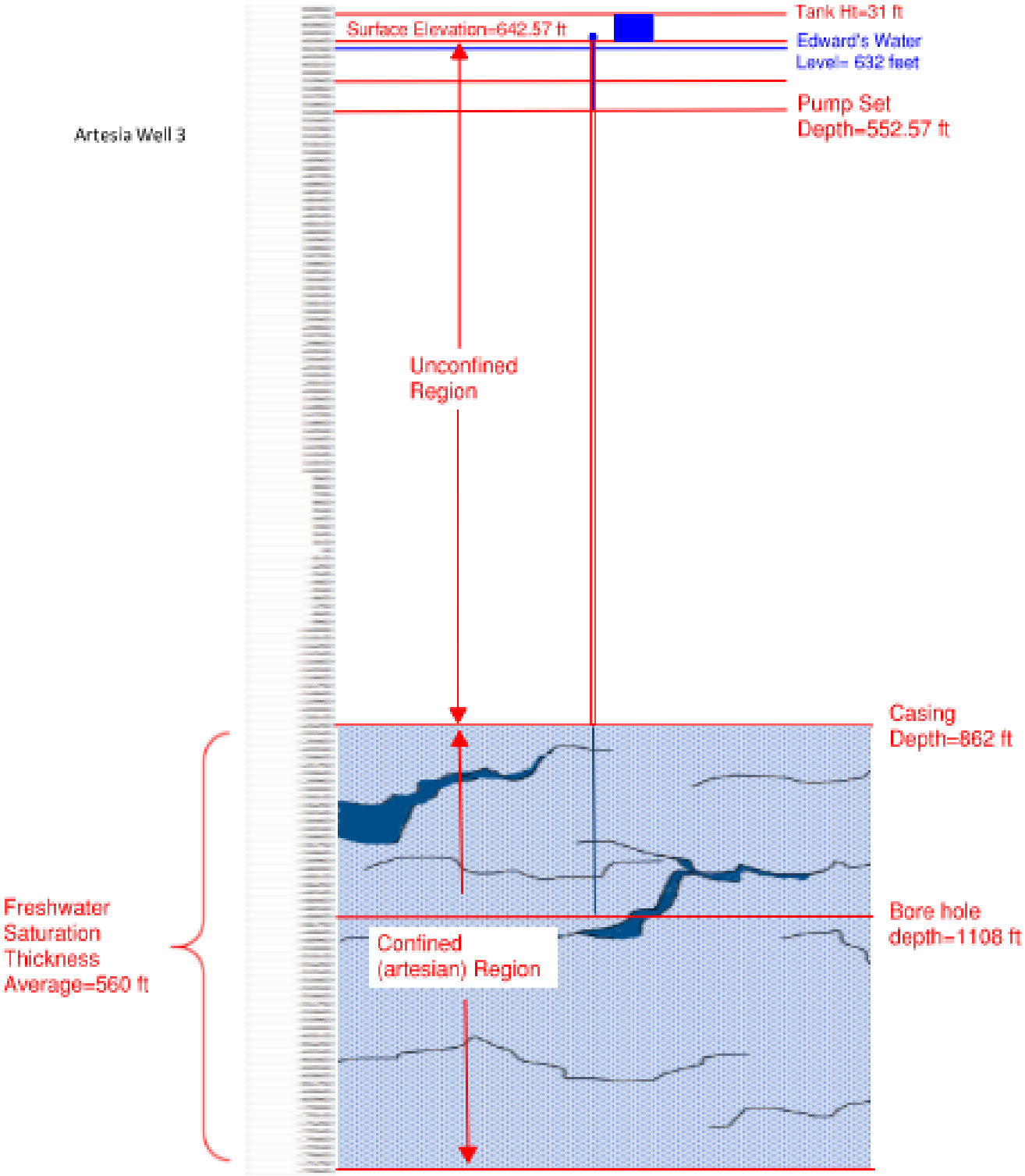


1. ***How deep are the well casings versus the pumps?***

Table 1. Artesia Pump Station Well Data

Station Name Well#	Capacity (MGD)	Surface Elevation (ft)	Year Drilled	Total Casing Length (ft)	Total Depth (ft)	Casing Diameter	Pump Depth from Surface (ft)	Well Status
Artesia # 3	10.1	642.57	1953	862	1108	26" from 0' to 157' 22" from 157' to 862'	90	Active
Artesia # 4	10.1	641.49	1958	982	1380	30" from 0 to 197' 26" from 197' to 840' 24" liner from 840' to 982'	N/A	Active
Artesia # 5	10.1	659.92	1960	968	1412	30" from 0' to 208' 26" from 208' to 968' 26" liner from 0' to 208'	90	Active

Figure 5. Approximate Scale graphic of SAWS Artesia Well 3.



2. ***Is it possible for the pumps to pull up blindcats from the depths that have been presumed for their habitat?***

The pump/motor combinations used in the SAWS wells identified in the SSA have the power and capability to draw water only from a depth of approximately 50 feet below their placement at the associated ground elevation. This is hundreds of feet above the assumed level of the Blindcats habitat.

It should be noted that in 1978, when the species were reported to be collected from Artesia PS, that these wells were flowing artesian the entire year. Meaning, the motors were not energized, and the pumps were not turning. Water flowed freely from the surface level of the Edwards aquifer into the ground storage tank on site. SAWS controlled overflow thereof with valving. Therefore, it is not possible to conclude that any Blindcat species pulled from the 1978 sampling of SAWS Artesia Pump Station were a result of groundwater pumping, as assumed erroneously by USFWS.

Additionally, and unlike other groundwater aquifers, flow patterns in a karst aquifer include complicated flow conduits, fractures and porous rock which all transmit flow with different flow patterns.

Table 2. System Porosity types in a Karst Aquifer (from Ghasemizadeh et al. 2012)

Flow characteristics of triple porosity components in karst aquifers

Permeability	Dimension	Travel Time	Flow Mechanism	Distribution
Matrix	μm to mm	Long	Darcy law, laminar flow	Continuous
Fracture	10 μm to 10 mm	Intermediate	Cube law, usually laminar flow	Localized
Conduit	> 10 mm	Short	Darcy-Weisbach, open channel and pipe flow, turbulent flow	Localized

Source: Ghasemizadeh, R., Hellweger, F., Butscher, C. et al. Review: Groundwater flow and transport modeling of karst aquifers, with particular reference to the North Coast Limestone aquifer system of Puerto Rico. Hydrogeol J 20, 1441–1461 (2012). https://doi.org/10.1007/s10040-012-0897-4.

Particularly with the Edwards Aquifer, water moves at varying speeds within the conduits, fractures, and matrices, making modeling flow within the Edwards Aquifer particularly challenging as does not fit the pure karst descriptions.

Based on the natural mechanics of a large complex artesian aquifer, which exhibits no classical draw down characteristics, and the designed engineering of the wells and pumps, it would be useless for the well pumps to move water beyond 50 feet. Therefore, the Total Dynamic Head (TDH) of the well pumps at the Artesia Pump Station is approximately 50 feet and the corresponding horsepower of the well pump motors ranges from 150-200 HP. In fluid

dynamics, TDH is the work to be done by a pump, per unit weight, per unit volume of fluid. TDH is expressed as the total equivalent height that a fluid is to be pumped, taking into account friction losses in the pipe. Each of the well pumps only have enough power to lift water the height of the TDH, in our case ~50 feet. This means that energy will be added to the water by the pump to be able to lift it from the static water surface, or slightly below, to the overflow of the receiving ground storage tank. Simply put, the pumps utilized do not have the power or capability to draw water from a depth beyond 50 feet or so of their placement in the casing which is hundreds of feet above the level of the assumed habitat of the Blindcats.

B. SAWS System Design and Operation

1. Pressure zones

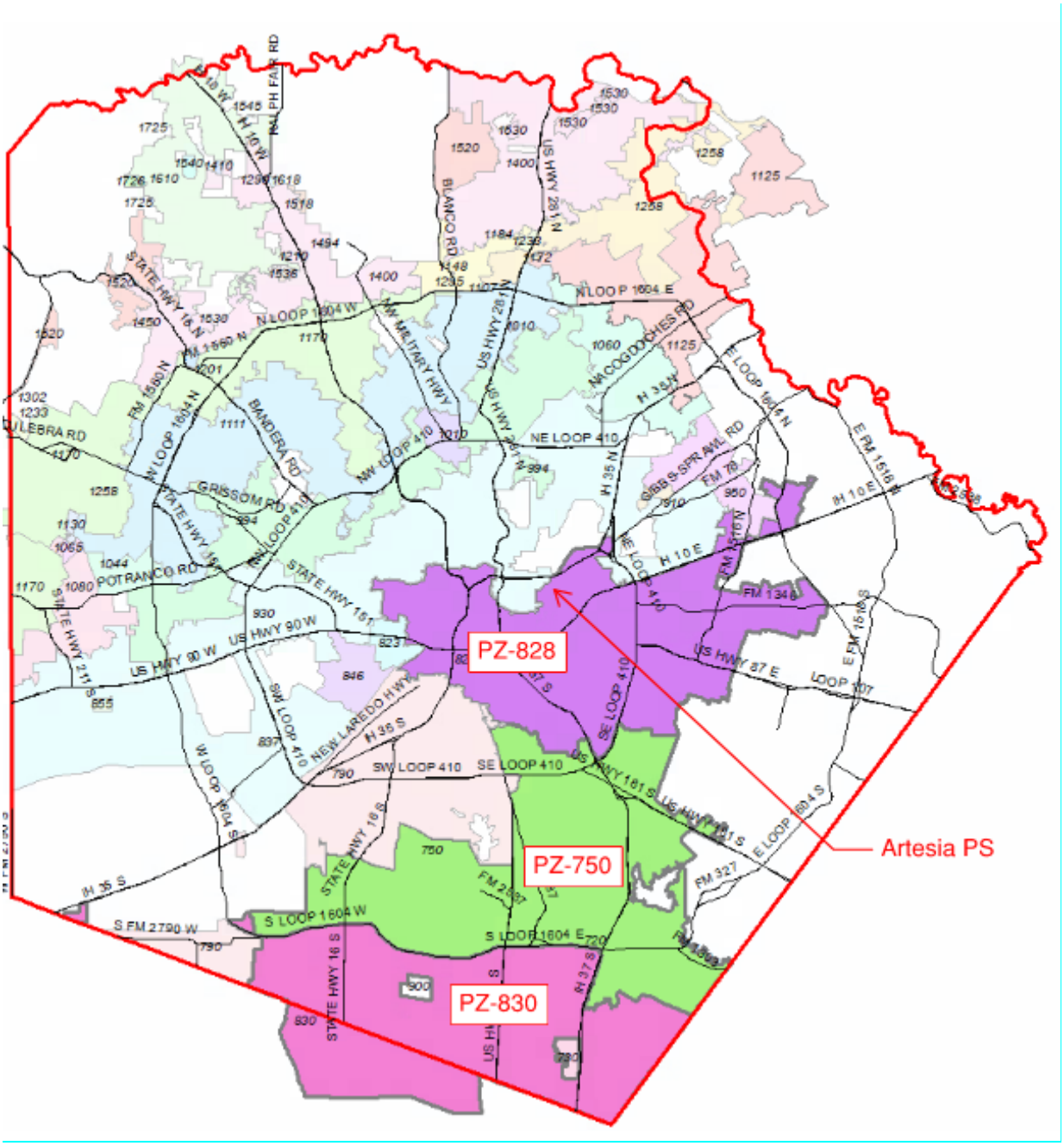
The SAWS service area is not centralized. Certain pump stations serve specific pressure zones (PZ) with occasional opportunities for interconnections between the zones. Pressure zones are distributed throughout the SAWS service area. They are made up of areas of land at ranges of topographic elevations. SAWS produces water from the Edwards Aquifer in centrally located pressure zones and then boosts it up to higher zones and reduces it down to lower zones. For example, the pressure zone within which the Artesia Pump Station (PS) is situated includes land at ground elevations that range from 580 feet to 700 feet. The service pressure that is provided results in water pressures between 56-107 psi to the customers. It is important to note that because of the design and functionality of the SAWS system a non-Edward's source entering a northern section of the SAWS service area cannot necessarily distribute that water to all other parts of the service area.

EXAMPLE: Pressure Zone 828

Source water for PZ-828 is either from the Edwards Aquifer via wells at five separate primary pump stations in the zone (including the Artesia PS) or from the H2Oaks Center. The non-Edwards Aquifer sources that can enter this zone are from the Carrizo and Wilcox Aquifers via the H2oaks Center. The H2Oaks Center is where the ASR facility is housed. Additionally, PZ-828 also supplies water to PZ-750 and PZ-830.

Total connections in the three pressure zones that rely upon the direct Edwards Aquifer supplies and the recovered Edwards Aquifer water from the ASR facility is 133,798, equating to approximately 368,000 people.

Figure 6. SAWS Pressure Zone 828 and Lower Supported Pressure Zones



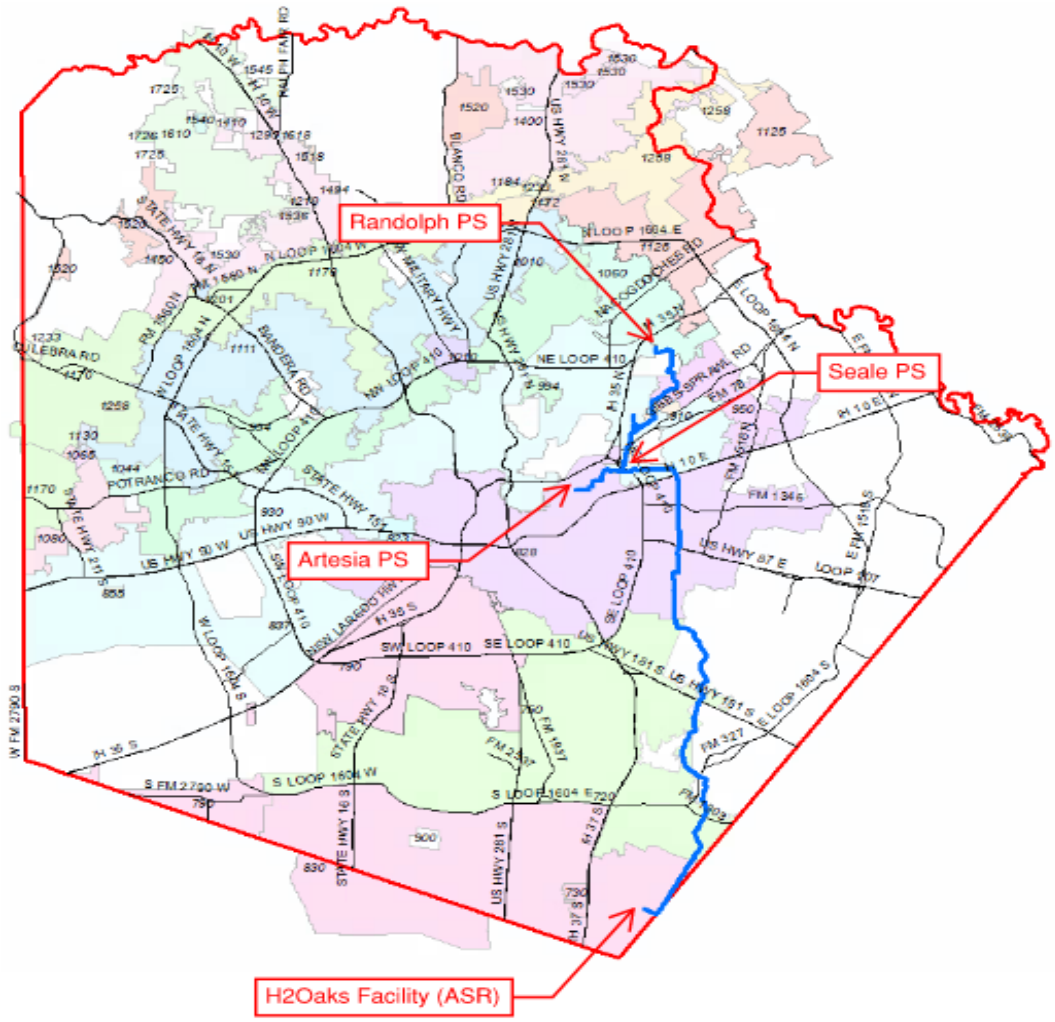
2. *Artesia/ASR Operations and EAHCP*

As stated above, SAWS relies on pressure zones to distribute water through the SAWS system. Artesia, Seale & Randolph are primary pump stations that provide Edwards Aquifer water to store in the ASR Facility. While all three provide water for storage, SAWS Artesia PS is the main facility in this operation, providing approximately 60% of the water stored. Water is either being stored or recovered continuously as part of SAWS daily operation depending on demand and other operational requirements and therefore, Artesia PS is critically important to the full ASR

operation. Without Artesia PS contribution, the SAWS ASR system would reduce in capacity by over half, therefore significantly limiting water provision from H2Oaks into PZ-828 in daily operation.

Additionally, as part of the EAHCP, SAWS uses regionally acquired permitted Edwards Aquifer withdrawal rights to store water in the ASR from these facilities during wet periods for use in the time of drought and forbearance/cutbacks. In exchange for permitted rights provided to SAWS, the EAHCP envisions further pumping forbearance/cutbacks by SAWS beyond all other permittees during severe drought.

Figure 7. SAWS H2Oaks (ASR) System of Water Mains



EAHCP conservation measures associated with SAWS ASR facility capabilities in relation to the EAHCP are designed to protect spring flow for federally listed threatened and endangered species during times of severe, long-term droughts. This is paired with other EAHCP conservation

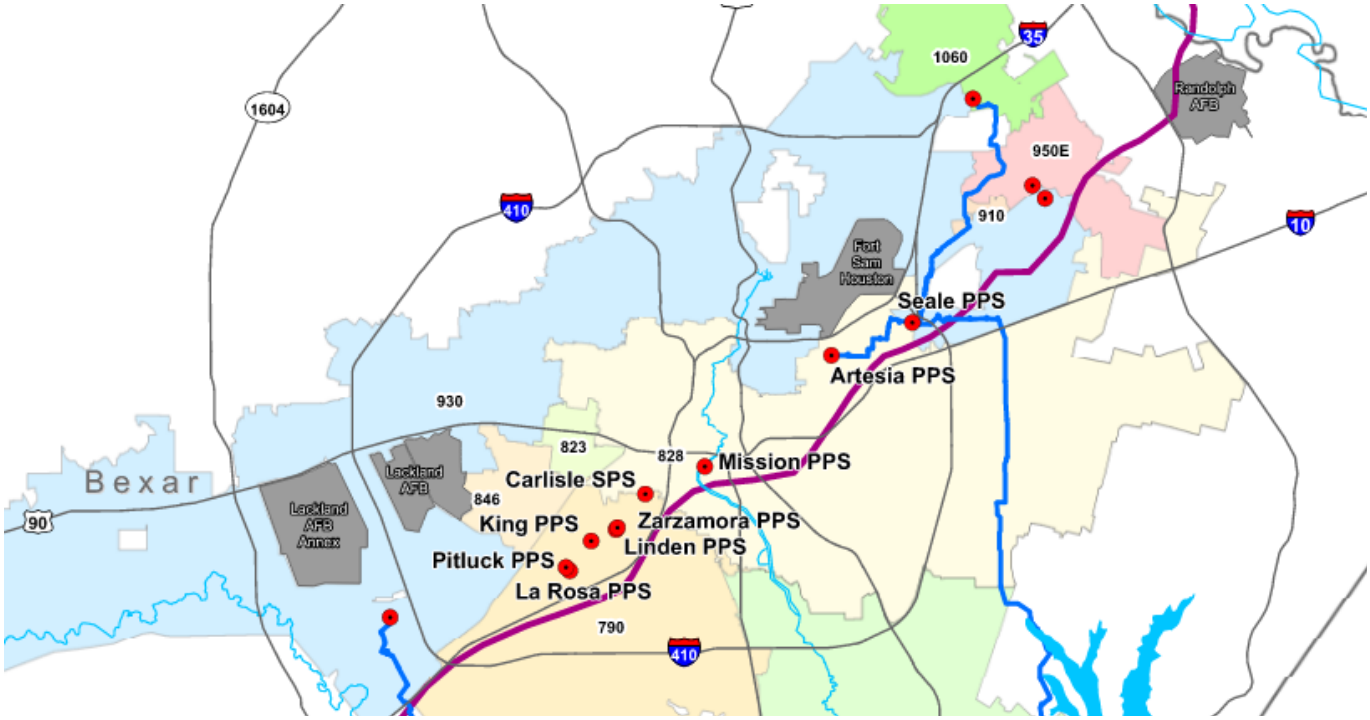
measures impacting municipal, industrial, and irrigation permit holders. through a market driven approach. All programs work together to ensure continuous spring flows to protect the species.

To ensure that federally listed threatened and endangered species that rely heavily on Comal and San Marcos Springs receive long term spring flow protection, modeling indicates that in the worst year of a drought combined with the other protection measures of the EAHCP the ASR measures are responsible for about half of the minimum continuous spring flow performance. The species protections provided by the EAHCP are not possible without the ability of the SAWS ASR system to function at least as it does today, and any changes to associated SAWS facilities, particularly that of Artesia pump station, would cripple, if not render impossible, a renewal of the EAHCP which expires in 2028.

3. Impact of Potential Listing

The map below depicts the SAWS wells that are referenced in the SSA. These wells are in pressure zones 828 and 790.

Figure 8. Map of SAWS wells referenced in the SSA



In PZ-828, there are a total of five primary pump stations that house Edwards Aquifer wells. At these stations there are a total of nineteen Edwards wells. Two of the five stations are referred to in the SSA, and these two stations house eleven wells which would be directly affected by the Proposal. Should the unsupported conclusion be drawn that pumping or artesian flow from these eleven wells are impacting species' habitat/mortality rate, the zone would be without production capacity of millions of gallons a day (MGD), and ASR recharge capacity would be equally reduced. This calculates to the water use for over half a million people each day on average using

SAWS GPCD of 117 from 2016. Ultimately, this would leave SAWS with significantly reduced volume of source capacity for the zone. TCEQ (the regulating body for drinking water in Texas) requires 0.6 gallon per minute (GPM) per connection of source capacity. The potential reduction in pumping could leave SAWS with a significant and serious immediate deficit of source capacity for the zone.

In PZ-790, four stations that house Edwards Aquifer wells are referred to in the SSA. These stations contain nine Edwards Aquifer wells with a total production capacity of in the millions of gallons per day. Therefore, the zone would be left without this capacity.

Significant impacts of the potential listing would be felt by the following entities:

- **Food Production**-HEB Food Processing Plant
- **Electric Utilities**-CPS Energy Braunig and Calaveras Power Stations
- **Public Health & Safety**- PZ-828 serves the central business district of San Antonio and many major medical facilities as set out below:

  Table 3: Major medical facilities contained within PZ-828 are:

ID	HOSPITAL
5	Southeast Baptist
11	Santa Rosa Senior Center - Southeast
17	Santa Rosa Rehab Center - San Saba
23	Metropolitan Methodist Hospital
27	Methodist - Central SA
29	Nix Medical Center
34	University Health Center - Downtown
35	University Center for Community Health
38	University Family Health Center - Southeast
130	Children's Hospital of San Antonio
138	Metropolitan Methodist Hospital
146	Mission Trail Baptist Hospital
157	Kindred Hospital - San Antonio Central
159	Baptist Medical Center
186	Texas Center for Infectious Disease
188	San Antonio State Hospital

- **Public Health & Safety**- PZ-790. Total connections in pressure zone 790 that are supplemented by the direct Edwards Aquifer supplies and the recovered Edwards Aquifer water from the ASR facility are 36,304, which equates to approximately 99,800 people. Medical facilities are also located in this zone, as set out below:

Table 4: Major medical facilities contained within PZ-5790 are:

ID	HOSPITAL
144	Southwest General Hospital
164	Baptist Emergency Hospital (Zarzamora)

- **Military**- Ft. Sam Houston's boundary is located less than 3,000 feet from the Artesia Pump Station. The base has its own Edwards Aquifer well(s) that are/is used to serve its services and inhabitants. There is a strong potential for impact to these wells by the Proposal. Furthermore, SAWS provides water to portions of Lackland AFB, and this area is planned to be added to SAWS PZ 828 (described above); and, therefore, impacts to PZ 828 will likely impact military missions at Lackland AFB. Additionally, the USAF also has Edwards Aquifer wells that are very near the saline water line at Lackland AFB. Depending on required actions, water supply to the military bases could be impacted.

III. Environmental Context & Analysis: Technical Comments on the Proposal

A. Comparison of key agency findings or decisions and the available base of information at the time.

USFWS has been considering the status of the Blindcats for more than 40 years. Below, we summarize the history of USFWS decision-making regarding the Blindcats and the information about these species that was available at the time (Table 5). The timeline shows that the USFWS's recent actions to pursue listing are inconsistent with its prior rationale and that the new information documented in Zara (2020) does not provide substantially new or additional information to support the change in position.

Between 1982 and 1998, a period of approximately 16 years, USFWS repeatedly acknowledged that it lacked "substantial," "conclusive," "persuasive," or "sufficient" data to meaningfully evaluate the status of the Blindcats in the context of the ESA. During this period, USFWS had available to it publications describing each of the species (e.g., morphology, anatomy, size distribution, gut contents) and documenting early records and localities (Eigenmann 1919, Hubbs and Baily 1947, Suttkus 1961, Karnei 1978, Longley and Karnei 1978a and 1978b, Langecker and Longley 1993). By its 1998 negative 90-day finding on the American Ichthyologists and Herpetologists Society and Desert Fishes Council petition to list, each species had been reported from 5 wells (with two of these wells producing both species) and collections included dozens of individuals. Most individuals were collected in the late 1970's during Karnei's graduate thesis work.

The Forest Guardians 2007 petition to list 475 southwest species did not offer any new information or analysis on the Blindcats not already available to USFWS. The petitioners only reference the information held in the NatureServe database at the time in support of their claim

that listing is warranted. Two years later in its 2009 positive 90-day finding, USFWS refers to NatureServe to summarize known localities. USFWS cites only two other citations in its positive 90-day finding, neither of which are presently cited in the NatureServe accounts (making it unlikely that they were cited in the 2007 version of these accounts). Nonetheless, USFWS states that these two publications (Ono et al. 1993 and Anderson et al. 1995) were readily available to it and were the substantive basis for its decision.

Of note, both of these "readily available" publications pre-date USFWS's prior 1998 negative finding. Further, the two cited publications address conditions (i.e., aquifer drawdown that moves the "bad water line", pollution and eutrophication, and invasive species) that USFWS has subsequently determined not to be threats to the Blindcats. USFWS clearly erred when it determined the 2007 petition (and other readily available information) presented substantial information that listing may be warranted. USFWS had already considered, many times, the available information about the Blindcats and determined, many times, that it lacked sufficient information to proceed.

USFWS appears to acknowledge in 2012 that pumping from the Edwards Aquifer is unlikely to adversely impact the Blindcats. The USFWS's draft Environmental Impact Statement ("EIS") evaluating the proposed approval of the Edwards Aquifer Recovery Implementation Program Habitat Conservation Plan ("HCP") and issuance of an incidental take permit states: "Because the actions contemplated within the study area are not anticipated to impact the deep Edwards Aquifer ecosystem or change the likelihood of exposing deep-water aquatic species to such threats, these species are unlikely to be adversely impacted by the considered alternatives, and are not considered further in this DEIS." The activities covered by the HCP and evaluated in the draft EIS included pumping from the aquifer by SAWS and groundwater withdrawals by other parties under the jurisdiction of the Edwards Aquifer Authority.

The Zara (2020) study sought to replicate the work of Karnei (1978) and Longley and Karnei (1978a, b) regarding the distribution of Blindcats and their frequency of detection. The Zara (2020) study, supplemented with follow on data reported by Diaz (2021) and in personal communications from Diaz to USFWS, is the only new information specifically addressing the Blindcats published after USFWS's 1998 negative 90-day finding. Further, as we consider in more detail below, the Zara (2020) study is both supplemental to and consistent with the findings of Karnei (1978) and Longley and Karnei (1978a, b), expands the local range and known distribution of the toothless Blindcat, and presents no reliable evidence of population trends for either species.

Yet, despite the consistency of the Blindcat survey data over time, the dismissal of the purported threats that prompted the 2009 positive 90-day finding, and a demonstrable reduction in the now-identified primary threat to the species (i.e., artesian discharge and pumping from groundwater wells, including wells where Blindcats have been detected), USFWS reaches very different conclusions about the present status of these species. The change in opinion appears to derive entirely from a presumption that the Blindcats have certain, strong "K-selected" life history traits that make them unable to numerically or demographically persist under the past, present, and likely future mortality from the operation of artesian groundwater wells. Instead, USFWS has crafted a supposed life history for the Blindcats from data on other species in other habitats. In

fact, USFWS has no information that provides direct or indirect evidence of any of these supposed life history traits or whether well mortality is actually driving the Blindcats towards extinction.

Table 5. History of Blindcat decisions and supporting information

USFWS Finding or Decision	**Discussion**	**Available Scientific or Commercial Information on Blindcats or Habitat**
1982 Category 2 Candidate Status (December 30, 1982; 47 FR 58454)	USFWS assigns Category 2 Candidate status to the blindcats. Category 2 Candidate species are "taxa for which information now in possession of the Service indicates that proposing to list the species as Endangered or Threatened is possibly appropriate, but for which ***substantial data are not currently available to biologically support a proposed rule***. Further biological research and field study will usually be necessary to ascertain the status of the taxa in this category, and it is likely that some of the taxa will not warrant listing" (47 FR 58454; emphasis added).	Early reports (Eigenmann 1919, Hubbs and Baily 1947, and Suttkus 1961) document initial discoveries, species accounts, and historic detections. Longley and Karnei (1978a and 1978b) are status assessments for each of the blindcat species that build on field work reported in the graduate thesis of Karnei (1978), The status reports were prepared on behalf of the USFWS. Together, the status reports document that wells associated with the historic (pre-1970's) detections were either capped or otherwise lost at the time of Karnei's field work. The reports also document Karnei's survey effort that sampled for Blindcats at 33 wells and two springs, detected one or both species at 3 wells. Based on the average flow rate of the Artesia Pump Station well (other wells were not used for this calculation) and the number of Blindcats collected over a 68-day period, the number of widemouth blindcats ejected from the well is 1 widemouth blindcat/6.2 days and 1 toothless blindcat/3.09 days. The authors estimated if the flow rate remained constant that 59

USFWS Finding or Decision	Discussion	Available Scientific or Commercial Information on Blindcats or Habitat
		widemouth blindcats and 118 toothless blindcats would be ejected per year at this well. Considering the best available information, Longley and Karnei (1978a, b) conclude "The numbers of fish collected during this study would indicate a very healthy population" and "From the study of distribution patterns, population estimates, and general condition of this unique ecosystem, we are convinced that [these] species [are] not endangered."
1985—1994 Category 2 Status Reaffirmed in 1985, 1989, 1991, and 1994	USFWS continued to identify the blindcats as Category 2 Candidate species in Notice of Reviews spanning a decade. Continued recognition of Category 2 Candidate status acknowledges that the present state of best available scientific and commercial information was insufficient to "biologically support a proposed rule" to list. In later notices, USFWS rephrases its description of Category 2 Candidate status as: Taxa for which information now in the possession of the Service indicates that proposing to list as endangered or threatened is possibly appropriate, but for which ***conclusive data on biological vulnerability and threat*** **(1989)** or ***persuasive data on biological vulnerability and threat are not currently available*** **(1991 and 1994)** or ***sufficient data on biological vulnerability and threat were not***	New publications during this period (1982 through 1994) addressed the geology and hydrology of the Edwards Aquifer (Marclay and Small 1986, Marclay et al. 1980, Groshen 1993) and the morphology, anatomy, and phylogeny of the blindcats (Lundberg 1982, Langecker and Longley 1993). Additional collections of both species were made in the early 1980s at wells that the SSA attributes to the Artesian Well #4 and the O.R. Mitchell well. The identity of the collectors and the nature of the collections (whether part of a study or incidental observations) are undescribed in the SSA.

USFWS Finding or Decision	Discussion	Available Scientific or Commercial Information on Blindcats or Habitat
	currently available **(1996)** to support proposed rules. In 1989, USFWS began to also estimate the status trends of species on its candidate list and assigned the blindcats as having "unknown" status, meaning that "additional survey work is required to determine their current trends" (59 FR 58982).	
1995 ASIH and Desert Fishes Council Petition to List (August 1995)	Petitioners claim to provide "the additional information on the status and vulnerability of this [sic] species requested by USFWS (Federal Register 1989, 54: 554-5) so that… [the blindcats] will be listed as endangered species." The petition notes that the Blindcats are troglobitic, have different morphologies that suggests different prey or feeding strategies, and are detected (often together) in artesian or pumped groundwater wells tapping the San Antonio Segment of the Edwards Aquifer near the "bad water line." The petition also suggests that the "single greatest threat" to the blindcats is "destruction, modification, or curtailment of their underground aquatic habitat by water level decline and/or bad water intrusion caused by human withdrawals of high quality Edwards water and the inadequacy of existing federal, state, regional, and local regulatory mechanisms." Other noted threats include "being sucked up and destroyed in local wellbores"	Additional publications regarding the hydrogeology of the Edwards Aquifer are available (Hovorka et al. 1995, Mace et al. 1995).

USFWS Finding or Decision	Discussion	Available Scientific or Commercial Information on Blindcats or Habitat
	and "contamination of its aquatic habitat due to chemicals (e.g., pesticides, fertilizers) used on the surface of the Edwards Aquifer recharge area and contributing zone." The petition acknowledges that "the size of [the Blindcat] populations cannot be estimated, nor their exact geographic range observed," but that "the number of blindcats emerging from the aquifer has decreased markedly during the past decade," citing to a personal communication from Glenn Longley. No additional information to support this claim of declining abundance is provided.	
1996 Discontinued Category 2 Status Classification (February 28, 1996; 61 FR 7596)	USFWS discontinued the use of the "Category 2 Candidate" classification. Neither Blindcat is identified as a candidate for listing.	Hovorka et al. (1996) addresses topics related to the geology and hydrogeology of the Edwards Aquifer.
1998 Negative 90-day Finding on ASIH and Desert Fishes Council Petition to List (September 9, 1998; 63 FR 48166)	USFWS determined that the August 1995 Petition to List "did not present substantial information indicating that these species warranted listing." USFWS stated that "uncertainties still exist regarding…the distributions of and extent of threats to the [blindcats]. The petition presented no information to resolve these uncertainties." The USFWS found that the petition provided no information that updated the findings of Longley and Karnei (1978a, b) or that offered evidence of population declines or threats from saltwater intrusion, direct	Groschen and Buszka (1997) addresses topics related to the geology and hydrogeology of the Edwards Aquifer.

USFWS Finding or Decision	Discussion	Available Scientific or Commercial Information on Blindcats or Habitat
	mortality from pumping, or contamination. USFWS stated that "information regarding the distribution of the blindcats and documentation and assessment of threats to these species are needed."	
2007 Forest Guardians Petition to List (June 18, 2007; received June 25, 2007)	Petitioners included the Blindcats in a mass petition addressing 475 southwestern species. The sole basis for the petition was a NatureServe ranking of G1 or G1G2. The petitioners rely entirely on the documentation and analysis of NatureServe to support their petition, stating "we hereby incorporate all analysis, references, and documentation provided by NatureServe in its on-line database." NatureServe ranked the Blindcats as G1G2 at the time of the petition, indicating some uncertainty as to the rarity, geographic distribution, or population trends for the species. The NatureServe accounts for the Blindcats were updated on October 6, 2023, with other specific areas of content last reviewed or updated in 2012. However, the current accounts acknowledge that population size and trends are unknown, but also cites Longley and Karnei (1978; for each species) to suggest that the species are apparently abundant. The NatureServe accounts identify over pumping that moves the location of the bad water line as threatening the species, without mention of direct mortality from pumping as a threat.	The present version of the NatureServe account does not list any information or data pertaining specifically to the Blindcats or their habitat that is more recent than the 1998 negative 90-day finding.

USFWS Finding or Decision	Discussion	Available Scientific or Commercial Information on Blindcats or Habitat
2009 Positive 90-day Findings on Forest Guardians Blindcat Petitions	USFWS determined that the Forest Guardians Petition to List "presented substantial information that listing…may be warranted." USFWS states that the Blindcats were each known to occur in 5 artesian wells penetrating the San Antonio pool of the Edwards Aquifer, citing to NatureServe's database in 2007. The USFWS determined that information in the petition and information that was otherwise readily available provided substantial information indicating that listing the Blindcats may be warranted. The USFWS identified two relevant listing factors contributing to its finding: 1) habitat destruction, modification, and curtailment resulting from water drawdown and pollution, and 2) competition from exotic species. The USFWS cites two sources of information as supportive of its findings: Ono et al. (1983) and Anderson et al. (1995). Neither of these sources are presently cited in the NatureServe accounts for the Blindcats (therefore, it is unlikely that they were cited in 2007) and would have also been "readily available" to the USFWS at the time of its 1996 discontinued Category 2 Candidate classification and the 1998 negative 90-day finding on the ASIH and Desert Fishes Council petition to list. The USFWS does not explain its shift in position.	Ono et al. (1983) – USFWS asserts that this report demonstrates that the aquifer is being overused/drawndown and contaminated by chemical pollution. Anderson et al. (1995) – USFWS asserts this report indicates that altered instream flow, eutrophication, and competition may be a threat due to the rapid increase of exotic species within Blindcat habitat. Both of these "otherwise readily available" publications were available for USFWS to review and consider when it made the prior negative 90-day finding in 1998.

USFWS Finding or Decision	Discussion	Available Scientific or Commercial Information on Blindcats or Habitat
2012 Edwards Aquifer Recovery Implementation Program HCP and EIS	At the end of 2012, the Edwards Aquifer Authority and its partners (including SAWS) released a final version of their HCP. The final HCP describes how a Covered Species Work Group examined the Blindcats for possible inclusion as covered species and ultimately "concluded that seeking coverage for these [deep] Aquifer species was not warranted." USFWS completed an EIS for its proposed action of approving the HCP and issuing the related Incidental Take Permit. The Final EIS is dated December 2012and states: "The Edwards Aquifer supports a unique ecosystem that contains a number of subterranean aquatic **species adapted to deep-water environments (greater than 985 feet [300 m] below the surface) such as the toothless blindcat (*Satan eurystomus*) and the widemouth blindcat (*Trogloglandis pattersoni*),** while the springs host a different assemblage of flora and fauna adapted to the distinctive conditions associated with these near-surface environments (Longley 1986, 63 FR No. 174 48166–48167). … The subterranean portions of the Edwards Aquifer support a highly adapted biological community that may be adversely impacted by many of the same threats as species at the springs, such as water quality contamination or degradation. **Because the actions contemplated within the study area are not**	Even after the USFWS's erroneous positive 90-day finding, the agency considered whether pumping from the Edwards Aquifer would adversely impact these "highly adapted" deep aquifer species. The agency determined, with little actual analysis, that the kinds of pumping addressed as covered activities in the HCP and Incidental Take Permit were unlikely to adversely impact the Blindcats. The brevity of USFWS's review of potential impacts to these species for which it was actively contemplating listing suggests that the agency considered this outcome obvious and non-controversial. USFWS's Biological and Conference Opinion for this action does not mention Blindcats or other deep aquifer species at all.

USFWS Finding or Decision	Discussion	Available Scientific or Commercial Information on Blindcats or Habitat
	anticipated to impact the deep Edwards Aquifer ecosystem or change the likelihood of exposing deep-water aquatic species to such threats, these species are unlikely to be adversely impacted by the considered alternatives and are not considered further in this DEIS." (emphasis added)	
Unified Agenda and Anticipated Date of Action Spring 2023 – 09/2023 Fall 2022 – 05/2023 Spring 2022 – 05/2023 Fall 2021 – 03/2022 Spring 2021 – 09/2021 Fall 2020 – 09/2021 Spring 2020 – 12/2020	USFWS has included a review of the Blindcats as a planned action on the Unified Agenda of Regulatory and Deregulatory Actions since Spring 2020. The anticipated date of possible action at the proposed rule stage was first identified as December 2020, but was pushed back in subsequent agendas. The current Spring 2023 Unified Agenda anticipated action in September 2023, almost three years after the first published date.	It appears that USFWS began substantive work on a listing rule following publication of the Zara (2020) report released in February 2020. Zara (2020) is a final report summarizing a survey effort for blindcats that sought to replicate the work of Karnei (1978). Using similar, although still variable, sampling methods, Zara (2020) looked for Blindcats at 41 wells between 2008 and 2014, only one of which had been previously sampled by Karnei and none of which were previously known to produce blindcats. Of these 41 wells, Zara detected toothless Blindcats at 3 (each a new known locality for the species) with a range of catch per unit effort among these sites of approximately 68 acre-feet to 425 acre-feet per detection. Zara (2020) increased the number of locations where toothless Blindcats have been recorded from 5 wells to 8 wells. One of these wells was described as a "6 km range extension to the southwest" for the toothless blindcat.

USFWS Finding or Decision	Discussion	Available Scientific or Commercial Information on Blindcats or Habitat
		Diaz (2021) and a subsequent personal communication in 2022 reported continued collection of toothless Blindcat parts from Aldridge 209 Well (one of the Zara-sampled wells) between 2020 and 2022. Zara (2020) did not document any widemouth blindcats during its study. But, notably, Zara (2020) did not sample any of the same locations where this species was previously known to occur. Zara (2020) also notes that species in this deep part of the Edwards Aquifer do not appear to be evenly distributed and only two wells have been known to produce both species. Therefore, the lack of new widemouth blindcat detections in this second set of sampled wells is not evidence that the widemouth blindcat is extinct or even that its population has declined in distribution or abundance.
2023 Warranted 12-month Finding and Proposed Rule to List as Endangered (August 22, 2023; 88 FR 57046)	In the proposed listing rule, USFWS now finds that the previously identified threats of habitat destruction, modification, and curtailment resulting from water drawdown and pollution, and competition from exotic species are not relevant to the Blindcats. Instead, "lethal discharge of the species through groundwater wells" is the sole threat to the species leading them towards extinction.	The technical basis for the proposed listing rule is the USFWS's November 2022 Species Status Assessment. The SSA asserts that Blindcats require conditions free of groundwater pumping to maintain "resilience." The SSA concludes "Well mortality has likely reduced the abundances of both blindcats

USFWS Finding or Decision	Discussion	Available Scientific or Commercial Information on Blindcats or Habitat
	USFWS relies on the catch per unit effort calculations based on the work of Longley and Karnei (1978a, b) and Zara (2020) to estimate "the cumulative loss of thousands of individuals" since groundwater pumping began in the late 19th and early 20th centuries. The USFWS then concludes, without evidence, that this cumulative mortality has likely severely reduced Blindcat populations. This conclusion is not based on comparison to total estimated population size or any evidence of population declines, but instead on inferred changes to Blindcat populations based on a set of assumed, K-selected life history traits. Of note, the USFWS press release announcing the proposed listing rule quotes Michael Warriner, Supervisory Fish and Wildlife Biologist for the Austin Ecological Services Field Office, saying that the Blindcats "are among the rarest fish species in the world." However, Longley and Karnei (1978a, b) interpret their data as indicating a "large" and "very healthy" population of both species. The more recent work of Zara (2020) not only produced catch per unit effort estimates within the range derived from Longley and Karnei (1978a, b), but also expanded the number of known localities and range of documented occurrences of the toothless blindcat. While Zara (2020) did not detect widemouth blindcats in any of its sampling, this	with concomitant effects on demographic structure in the form of lower numbers of sexually mature fish, reduced reproductive output, and diminished recruitment of younger individuals." Further, the SSA speculates that because the widemouth blindcat has not been observed from any well in the last 38 years it "may have may have declined to undetectable numbers or become functionally extinct." The SSA predicts the future condition of these species as trending towards extinction based on continued levels of groundwater use and "**Our hypothetical review of potential losses of individual fish to groundwater wells over time**...." (emphasis added)

USFWS Finding or Decision	Discussion	Available Scientific or Commercial Information on Blindcats or Habitat
	study also did not sample any sites previously known to produce this species. The prior studies demonstrate that not all wells produce Blindcats, and not all wells that produce one species also produce the other. Therefore, the lack of widemouth blindcat detections is not dispositive as to a presumed reduction in distribution or abundance.	

B. Acknowledged but unreconciled uncertainty and data gaps.

The Proposal and SSA identify but do not reconcile the implications of substantial uncertainty and critical data gaps in essentially every element of USFWS's analysis, including: life history traits (e.g., longevity, reproduction, life stages and growth patterns, diet and feeding behavior), habitat needs and use patterns, physical habitat characteristics, population size, population range and distribution, and individual or population responses to change. The use of qualifier terms, such as "might" or "potentially," is extensive in both documents, as summarized in Table 6.

Table 6. A count of the number of times each qualifier term appears in either the SSA or the listing proposal.

Qualifier Term	SSA	Listing Proposal
likely	32	40
may/might/maybe	65	66
could/can	70	37
probable/probably	10	2
potential/potentially	81	34
assume/assumed/assumption	28	10
unknown/not known	17	4
think/thought	5	0
hypothesize/hypothesized/hypothetical	19	2
appear/appeared/appears/apparently	11	8
suggest/suggested/suggests	28	6
suppose/supposition	5	0
presume/presumed/presumably/presumptive	10	3

expect/expected/expects	23	6
postulate	7	1
anticipate/anticipated	3	0
TOTAL	**414**	**219**

Below are several examples from the SSA and Proposal that demonstrate how speculation underlies all aspects of the analysis and conclusions.

- "*However, given their obligate dependence and adaptation to subterranean conditions, the blindcats **likely share broad life history traits in common with similarly adapted fishes**. Where appropriate we apply information from better-studied cavefish species to assessment of blindcat status*." (SSA pg. 6; emphasis added). USFWS makes and applies this assumption to the Blindcats without any evidence of the actual life history traits of the Blindcats or an explanation for why these unrelated species from unrelated environments might be adequate surrogates.

- "*Because the toothless and widemouth blindcats are among the deepest and oldest known subterranean fish species the blindcats **may display more pronounced K-selected traits***." (SSA pg. 44; emphasis added). "*Given their long evolutionary history, the toothless and widemouth blindcats are **likely strongly K-selected and comparable to, if not more sensitive than, most other stygobiont fishes** in their response to increased loss of individuals from populations (Poulson 2001, p. 355).*" (SSA pg. 52; emphasis added). USFWS provides no rationale for why being among the "oldest known subterranean fish species" and having a "long evolutionary history" would result in "likely strongly K-selected" traits and make them more sensitive than other cave fish. Also, USFWS has no information about what habitat conditions for these fish were like were like over geologic history, with very little information about habitat conditions even today.

- "*The toothless and widemouth blindcats **could occur outside of this area**, but until new localities are discovered and verified, **we assume the species are limited to an area** of high hydraulic conductivity, paralleling major groundwater conduits and the Freshwater-Saline Water Interface*." (SSA pg. 29; emphasis added). Here, USFWS declines to adopt speculation about a possibly broader distribution for the species. It fails to adopt this degree of caution for other elements of its analysis.

- "*Because the blindcats are obligately subterranean, we **assume that they follow similar life-history patterns** as other stygobiont fishes with females reproducing at later ages, a small percentage of females producing offspring annually, smaller clutch sizes, and longer lifespans. **Age at first reproduction is assumed to be longer** than that of surface ictalurids (i.e., > 2 years) **and probably similar or longer than** age at reproductive maturity noted for the northern cavefish (i.e., > 6 years) [Niemiller and Poulson 2010, p. 221]. Also, like stygobiont amblyopsids (Niemiller and Poulson 2010, pp. 221–222), Because the blindcats are obligately subterranean, **we assume that only a fraction of female toothless and***

widemouth blindcats produce offspring on an annual basis *(e.g., 3%–13%).* ***Clutch size is likely comparable to the small clutches produced by Noturus species (e.g., < 200 eggs). Adult toothless and widemouth blindcats probably reach significant ages for ictalurids, with maximum ages of multiple decades (e.g., >25 years).*** *The blindcats inhabit a subterranean system that is well-buffered from immediate seasonal changes. However, seasonality of reproduction cannot be dismissed as these fish may respond to periods of high or low groundwater flow in relation to aquifer recharge*." (SSA pg. 35; emphasis added). Not only does USFWS speculate that the Blindcats "likely share broad life history traits," with these other species, as described on page 6 of the SSA, but here USFWS goes so far as to estimate actual values for these traits. The Proposal takes this speculation another step further by stating unequivocally that "*These species have life-history traits that limit reproductive capacity and recruitment, as documented in other cavefish species. These same traits make the blindcats more susceptible to long-lasting population impacts from well mortality losses*." (Proposed listing rule pg. 57056). USFWS actually has no scientific or commercial information documenting any life history trait of either species.

- "*For both species, those researchers* ***assumed that fish were randomly exposed to capture*** *by sampled wells and not clumped due to rate of water flow from those wells (Longley and Karnei 1978a, p. 35; 1978b, pp. 36, 38).*" (SSA pg. 41; emphasis added). As described in more detail below, this assumption is overly simplistic and not likely representative of Blindcat habitat use or exposure to zones of influence from wells in the complex hydrogeologic space of the Edwards Aquifer.

- "*The species' occurrence from multiple wells along a southwest to northeast trending line in Bexar County* ***suggests that the ranges of both species might be relatively continuous.*****"** (SSA pg. 2 and 43; emphasis added). First, the amount of sampling for these species has been very small and wells were not evenly sampled across the San Antonio pool sampled by Karnei (1978) and Zara (2020) in time or space. It is premature to opine on the range of either species with so little data. Other species listed on the basis of presumed "restricted ranges" (e.g., the Bone Cave harvestman) have been later shown to be distributed much more widely than previously believed. Also, there is little information to base an assumption that the two species, which have different morphology and anatomy that suggests different positions in the ecosystem (predator vs detritovore), would use the complex environment of the aquifer in similar ways and to similar (continuous) extents.

- "*The toothless and widemouth blindcats inhabit an interconnected subterranean system that facilitates gene flow across their ranges. As such,* ***we apply the presumption that these two species are sympatric and each exists as singular, interbreeding populations***." (SSA pg. 44; emphasis added) USFWS relies on a "preliminary evaluation" of genetic population structure for another species (a salamander) that uses a "structurally different portion of the aquifer" and a list of citations about other species in different aquifer systems to make this "supposition" about two different blindcat species. USFWS provides no information to link these other species or geographies with either the blindcats or the deep San Antonio pool of the Edwards Aquifer.

- "*As we* ***assume the blindcats have long lifespans, there is an increased likelihood that individuals will encounter the capture zone of an active groundwater well****. Wells operating over several decades, and discharging relatively moderate volumes of groundwater,* ***could result in the loss of over a thousand toothless and several hundred widemouth blindcats per individual well*** *(Table 9)*." (SSA pg. 75; emphasis added). This statement illustrates USFWS's use of speculation in both the assumed lifespan for the Blindcats, for which there is no data; the movements of Blindcats in their habitat, for which there is no data; and the biased and uniform application of the highest estimated CPUE among a range of estimates to imply that some, many, or maybe even most wells may be discharging hundreds or thousands of fish.

C. Compounded assumptions and bias.

USFWS's primary rationale for listing the Blindcats is based on estimates of well mortality and the implications of this estimated past, present, and future mortality on Blindcat abundance over time. At each step, USFWS addresses uncertainty by making assumptions that sit at the most extreme end of the range of possible or probable values. Estimated levels of groundwater well mortality, calculated from the highest value among the wide range of lethal catch per unit effort among 6 Blindcat-producing wells, is deemed significant in the context of an assumed set of K-selected life history traits. Each of the assumed K-selected traits assigned to these Blindcats is assumed to have value at the most strongly K-selected end of the range of values presented for identified surrogate species (i.e., presuming that the Blindcats exhibit traits that are more strongly K-selected than not).

Likewise, USFWS appears to assume that the Blindcats are "among the rarest fish species in the world," based on statements by the Michael Warriner, the primary author of the SSA. This statement demonstrates the agency's bias towards listing, despite the best available data being (at best) inadequate to understand the true size, distribution, or range of these species or (at face value) concluding that populations are healthy and abundant (Longley and Karnei 1978a, b).

On the basis of these compounded assumptions, USFWS reasons that Blindcats are unable to accommodate the estimated level of human-caused mortality. However, no part of this analysis is grounded in clear evidence or robust data.

D. Reliance on speculation.

USFWS instead relies on speculation regarding the biology, life history, habitat, and status of the Blindcats. These life history traits described for the Blindcat species are created out of bits and pieces borrowed from other (often similarly poorly studied) species and habitats.

In the absence of species-specific information on life-history traits, habitat use, biology, behavior, swimming ability, etc., USFWS speculates that pelagic deep-sea fishes and other stygobiont fishes in shallow cave and spring systems are suitable surrogates for Blindcats. However, the literature cited by USFWS does not support these claims. One of the primary citations used (Poulson 2010) provides "…a presentation of retrospective and prospective ideas…" based on the author's experience working with shallow cave species and his "insights" on deep-

sea pelagic species based on the work of others. This article is used extensively throughout the SSA to support the USFWS's opinions on Blindcat ecology and similarities to cavefishes and deep-sea organisms. However, the article does not provide any scientific evidence of similarities between Blindcats, cavefishes, and deep-sea fishes but rather is a reflection on someone's career experiences working with Amblyopsid cavefishes and hypotheses that have come from those experiences. Poulson's article is a useful contribution to science to help guide future work to better understand cave fish ecology but does not meet the standards for best available science that should be used when making listing decisions for Blindcats.

Any comparisons of Blindcats to deep-sea fishes is inappropriate based on the Poulson (2010) article. Poulson clearly states in the article that he is showing how the work and findings of others who research deep-sea organisms have "…influenced my thinking about adaptations to caves among amblyopsid fishes…". Poulson's article is a reflection on a commendable career working on fishes in the Amblyposidae family but does not scientifically demonstrate any relationships between deep-sea fishes and cavefishes, much less any relationship with Blindcats. The article should not be used to suggest that Blindcats are similar to deep-sea fishes.

Comparison of characteristics of fishes from the Amblyopsidae family described in Poulson (2010) and Niemiller and Poulson (2010) to subterranean members of the Ictaluridae family (i.e., the Blindcats) are not appropriate. Poulson (2001) provides ideas and reflections on amblyopsids and does not discuss any similarities between those fishes and blindcats. Amblyopsids are thought to be most closely related to pirate perches and trout perches in the order Percopsiformes (Niemiller and Poulson 2010), while Blindcats are ictalurids in the order Siluriformes. Pirate and trout perches and catfishes have different reproductive strategies, life-history requirements, and habitat preferences. Comparisons of the ecology and life-history of pirate and trout perches and catfishes in surface water systems would not be used to support an ESA listing determination as it would not meet the best available science standard that USFWS must adhere to.

Similarly, comparisons of amblyopsids and subterranean ictalurids should not be made to support listing of the Blindcats. Amblyopsids occupy shallow cave and swamp systems, often with measurable velocities, which are regularly refreshed with detritus and other organic materials from surface flooding (Poulson 2001, Niemiller and Poulson 2010). Several of the amblyopsids even venture outside of cave systems to forage. USFWS recognizes the differences between the two species groups when they state in the SSA: "The environmental stressors that typically affect and influence shallow subterranean systems (e.g., flooding, drying of cave passages/streams, and reduced surface nutrient input) are presumed to not operate, or are muted, at the depths the blindcats occur. The deep artesian zone of the Edwards Aquifer provides a stable nutrient source (i.e., chemolithoautotrophy), consistent water quality (i.e., decades old groundwater), and very attenuated responses to climatic changes (e.g., temperature changes) on the surface." However, USFWS continues to arbitrarily compare the species groups, behaviors, habitats, and life histories despite the recognized differences.

USFWS compares the entrainment of Blindcats in pumped wells to the collection of cavefishes or the commercial harvest of deep-sea fishes to support the following statement in the SSA: "In essence, the capture zones of many groundwater wells may constitute near-permanent population sinks that can result in the mortality of most all blindcat life stages. Loss of immature to adult individuals would constrain population growth through reductions in egg production and recruitment of mature adults. The impact of groundwater well mortality on toothless and widemouth blindcat populations could be substantial." USFWS does not provide any scientific evidence that discrete pumping events in localized areas would be equivalent to or worse than purposeful collection of cavefishes or commercial harvest of marine fishes. Nor does USFWS provide any evidence that entrainment of Blindcats in localized capture zones would create "near-permanent population sinks", lead to "…reductions in egg production and recruitment of mature adults," or result in "substantial" mortality to blindcat populations. These kinds of statements require scientific evidence rather than the speculation and arbitrary determinations of mortality that USFWS has made.

Even under the theory posited by USFWS that some level of mortality does occur from groundwater pumping, there is no evidence presented to demonstrate that the mortality will result in population-level impacts similar to that observed from commercial fishing or result in the sustained levels of mortality described in section 9.2.1 of the SSA where USFWS states that because they "…assume the blindcats have long lifespans, there is an increased likelihood that individuals will encounter the capture zone of an active groundwater well." This assumption results in USFWS determining that groundwater pumping, similar to commercial fishing, will result in continued and long-term removal of the Blindcats from the aquifer. However, USFWS ignored published information that counters their assumption. Poulson (2001) stated that cavefishes "Cannot swim well against fast currents despite well-developed musculature. Their normal musculature allows them to forage in areas of slow current and behaviorally avoid fast currents. I have watched cavefish (*Amblyopsis spelaea*) seek quiet areas under ledges and in back eddies when stream velocities are high during floods and Pearson (personal communication) has seen *Typhlichthys* hide when faced with only subtle increases in stream velocity." The Blindcats may have evolved in a system where areas of high velocity were not encountered or were avoided. Rather than continuous, sustained mortality as described by USFWS, it is equally or more likely that Blindcats behaviorally avoid increased velocities in the capture zones around wells resulting in decreased entrainment of individuals over time rather than the continuous and long-term mortality that USFWS arbitrarily assumed. While we have cautioned the comparison between amblyopsids and Blindcats, USFWS should have considered behavioral avoidance as a possible mechanism for low catch-per-unit effort in some locations rather than assuming that low rates of capture were a result of decreased population size.

Additionally, no consideration is given by USFWS to the fact that the Widemouth species feeds on the Toothless species and their presence in wells could be due to attempted but failed consumption by the Widemouth.

USFWS implies that it knows what conditions are needed by the Blindcats to remain "resilient" over time, including the "absence of groundwater well mortality" based on what it

believes are its strong K-selected life history traits (see "Factors to Maintain Resiliency" on SSA pg. 45; emphasis added):

> Based on these assumptions, populations of the toothless and widemouth blindcats **require the following factors to maintain resiliency** over the long-term:
>
> **Absence of groundwater well mortality**: The blindcats are stygobionts and **may display K-selected life-history traits** (e.g., delayed sexual maturity, lower fecundity, and long-life spans), as documented in other stygobiont fishes, including:
> - Females reproduce at later ages (i.e., > 6 years)
> - Small percentage of females produce offspring annually (i.e., 3%–13%)
> - Small clutch sizes (i.e., < 200 eggs)
> - Long lifespans (i.e., > 25 years)

USFWS continues to rely on these speculated traits – even modifying their prior language of "may display K-selected life-history traits" to a much stronger statement of "given their K-selected life history traits that limit reproductive capacity and recruitment" -- to make its case that the species are being driven towards extinction by groundwater wells (see "Future Scenario Conclusions" on SSA pg. 94):

> It is unlikely that even relatively robust populations of blindcats could indefinitely sustain losses from well mortality given their K-selected life history traits that limit reproductive capacity and recruitment. With ongoing well pumping, we would project that both the toothless and widemouth blindcats will be reduced to such small numbers that these fishes will be at risk of extinction before 2100.

Of note, USFWS does not actually project any population declines for either species using its assumptions about the life history, population size, and range/distribution. There is no analysis of estimated mortality against estimated abundance that considers the population dynamics implied by the assumed life history traits, the known distribution of groundwater wells, and how these wells are operated. The SSA and Proposal simply assume that such declines are occurring.

E. What the actual data says.

The evaluation of Blindcat abundance in the SSA relies on two sets of studies conducted by Karnei (1978) (further documented and analyzed in Longley and Karnei 1978a, b) and by Zara (2020). Both sets of investigations involved filtering well water through netting and standardizing the contents by the volume of water filtered to produce a measure of relative abundance (catch per unit effort [CPUE]).

(i) The probability of detection was extremely low.

While both sets of investigators diligently tried to sample these very difficult-to-access fish communities using the best equipment available for each location, detection probability was low in all cases. Where Blindcats were collected, they required days or weeks of sampling to detect, and the evidence was often microscopic and easy to miss. For example, Zara (2020) describes, "…however, during a site visit [to Jeff Bailey Well] on 30 September 2011, a single bone was retrieved and subsequently identified as belonging to the toothless blindcat. Another sample containing a complete pectoral-fin spine and a small fragment of cleithrum representing the toothless blindcat were collected on 6 October 2011." (page 23). Karnei (1978) describes the damage and destruction of sample contents due to "extreme water pressure" (page 24). Where blindcats were detected, we have evidence of species presence. However, given the extreme difficulty in detecting these species, empty samples cannot be reasonably used to establish species absence.

(ii) The CPUE data are unreliable due to sampling variability

Zara (2020) followed the methodology of Longley and Karnei (1978a, b) to estimate CPUE, intending to compare the results of the two studies. However, inconsistencies in the sampling methodology introduce substantial variability into the results and preclude meaningful comparisons of CPUE between the two studies, among locations, or over time.

- With one exception, none of the same wells were sampled by the two sets of investigators due to changes in access and well operation. The one well sampled by both sets of investigators (i.e., San Antonio Zoo) was never known to have Blindcats. There is no evidence to suggest that the Blindcat populations are evenly distributed throughout the aquifer, so differences in CPUE between two studies surveying different locations cannot be used as evidence of a change in species abundance over time.
- The sampling equipment used varied between studies and among sampling locations. The detection rate using these gear types was not determined, but differences in detection rate would introduce systematic bias into the CPUE estimates.
    - Funnel nets (two types) were used by Longley and Karnei (1978a,b)
    - Net, barrel, in-line, or bottle filters were used by Zara (2020), whichever appeared most effective at an individual well
- The flow sampled varied among wells and over time at the same wells. As described in the SSA (see Figure 22), the capture zone differs based on the rate of pumping, so the amount of habitat sampled varied spatially and temporally. It is also unknown how water volume relates to habitat quantity in the sampled environment and for these Blindcat species.
- In considering these samples representative of the population, the investigators had to assume that there was no "clumping" in the distribution of Blindcats across those habitats. This assumption is unsubstantiated and unlikely.

  - Given differences in the assumed feeding strategies of these species (i.e., predator [widemouth blindcat] versus detrivore [toothless blindcat]), it is reasonable to assume the opposite—that these species use the habitat differently in locations where they co-exist.
  - Where the pumps have been operating a long time (i.e., at all the wells sampled), the fish may have learned to avoid the capture zone, or the capture zone may have been previously depopulated. Thus, fish density within the capture zone may not represent fish density outside the capture zone at that location.

- The number of samples taken at an individual well varied (e.g., the number of samples ranged from 1 to 153 at wells surveyed by Zara 2020]), the timing and duration of sampling varied, and the volume of water filtered varied, resulting in a widely variable survey effort. Where the effort was greater, the investigators had a greater probability of detecting the species given the low detection rates for these species.
- In the calculation of CPUE, all the samples from a well were grouped and standardized by volume of flow filtered. Mathematically, this is a single sample. There is no way to calculate the confidence in this CPUE estimate (e.g., confidence intervals) from a single sample. It is equally impossible to compare two single samples and determine a statistically meaningful difference.
- CPUE may be biased by changes in detection rate resulting from changes in well operation or artesian pressure in the aquifer. The relatively high CPUE at the Artesia #4 well in 1978 may be a product of different well operations in that year. For the entire year of 1978, this well was flowing under artesian conditions, so no pumps were needed to bring the water to the surface. If the pumps were not operating, it is more likely that the fish that came to the surface were intact and more easily detected by surveyors.

(iii) Expansion of the maximum sample CPUE does not produce a reliable measure of potential fatality.

Considering the unreliability of the CPUE results, it is unreasonable to expand the highest CPUE rate measured (by definition, a measure that has been unrepeatable) to 51 wells operating over a 66-year lifetime to estimate potential fatality (see Table 1 in Proposal). The CPUE measured at the Artesia Pump Station is functionally a single sample collected at a single point in time 45 years ago with no associated measures of accuracy or precision.

The SSA was correct when it described the limitations of these hypothetical scenarios of groundwater well mortality: "They do not account for variability in distribution and extent of suitable blindcat habitat, fish abundances by site, well size and discharge capacity, periods of discharge (e.g., intermittent or constant), location of well casing relative to potential habitat, and reporting of discharged volumes. Complete data on those, and other variables, are not available." (USFWS 2022, page 74). These limitations are fatal flaws for meaningful data expansion.

Furthermore, by expanding this single CPUE measure, USFWS is assuming the population of these fishes are evenly distributed over their range. This assumption is disputed by the analysis in Zara (2020), in which the authors conclude, "A community composition analysis of our sample set compared to historical samples collected by Henry Karnei in 1978 yielded no support for the hypothesis of an even distribution of species across the aquifer." (Abstract). This expanded CPUE estimate does not represent a reliable characterization of well mortality upon which to base a listing decision.

(iv) The presence results are consistent for toothless blindcat and inconclusive for widemouth blindcat.

Considering the species presence data, the findings of the two sets of investigators were not substantially different.

- Zara (2020) sampled 41 sites (875 samples) and detected toothless blindcat at 3 of those sites.
- Longley and Karnei (1978a, b) sampled 33 sites (undisclosed number of samples) and detected toothless blindcat at 3 of those sites and widemouth blindcat at 2 of those sites.

Zara's (2020) failure to detect widemouth blindcat may be due to:

- Chance, because they had an extremely low probability of detection;
- Differences in species distribution, because they did not sample in locations where widemouth blindcat were previously documented; or
- Extirpation of widemouth blindcat.

Given no additional evidence, it would be arbitrary to select one of these explanations over another. There is insufficient evidence to evaluate the status of the Blindcats.

F. Aquifer characteristics suggest the Potential Area of Occurrence is larger than described in the SSA.

The area USFWS describes as potentially occupied by the Blindcats has greater aquifer hydraulic conductivity than other portions of Bexar County. But, cave-sized conduit development is present throughout the recharge and confined portions of the Edwards Aquifer. Cave passages are known to occur within the recharge zone (Veni 1985) and major groundwater conduits have been inferred to exist from Medina County, east to northeast through Bexar County, and into Comal County (Worthington 2003, pp. 31-32; Hovorka et al. 2004, pp. 39-42; Lindgren et al. 2004, pp. 19-22). By nature of being a karst aquifer with high hydraulic conductivity values, high well yields, and significant spring outflows, conduits smaller than cave-sized passages (nonetheless adequately sized for potential movement of Blindcats) are present throughout the Edwards Aquifer. Therefore, conduits for Blindcat movement and occupation are present outside the limits of Blindcat habitat

identified in the SSA. The likelihood of intercepting conduits occupied by Blindcats with a well borehole may be less in portions of the aquifer where hydraulic conductivity values are lower. But suitably-sized conduits exist throughout the aquifer and, in the absence of other clear habitat requirements, suggest that potential habitat may occur over a much wider area than currently assumed.

USFWS specifically excluded shallower wells, as they would not produce the species because they do not reach their presumed habitat. This does not however, mean that the species are not there. Rather, it is saying that USFWS (or others) lack the ability to examine the wells for potential abundance of the species in other areas. Including other locations along the "bad water line" in Hays, Comal, Guadalupe and Medina counties as well as those associated with the Uvalde pool. Just because they did not search these locations does not mean that the species is not present.

G. Blindcat capture as a function of up-hole velocities in wells.

Even when a well is drilled within Blindcat habitat and suitably sized conduits are intercepted by the borehole, the chance of a Blindcat entering the borehole and being discharged at the surface is likely to be slim. When a well is not pumped or is not flowing from the well under artesian pressure, no forces would draw blindcats into a borehole. When a well is pumped or allowed to flow freely under artesian pressure, water would enter the borehole through at least one, but possibly many conduits intercepted by the borehole. The velocity at which water would move into the borehole would be a function of the pumping or flowing rate of the well, and the number and diameter of the conduits intercepted by the borehole.

For example, the velocity of water moving up a 12-inch diameter borehole at a pumping rate of 1,000 gallons per minute (gpm) is approximately 3 feet per second (fps). If that flow rate is fed by one, 12-inch diameter conduit or an irregular shaped conduit of the same size, then the flow rate through the conduit would be the same. If multiple conduits are intercepted by the borehole, then the flow rate would be distributed between the conduits and the flow rate through each conduit would be less. The greater the number of conduits intercepted by a borehole, the more diffuse the flow rates through the conduits would be, which would result in a smaller chance of capturing catfish from water flow into a borehole. Conversely, if all of the flow entered the borehole from one conduit smaller than 12-inches in diameter, the flow rate would be greater than 3 fps.

Therefore, it is apparent that depending on the complex and specific configuration of the aquifer at the borehole, Blindcats may or may not be captured by wells even if the wells are drilled through Blindcat habitat. The small number of wells that have been documented to yield Blindcats may be less a reflection of Blindcat abundance or distribution, but rather more of a function the limited chances that a well will ever capture one in a complex environment.

This complexity contributes to the difficulty (or impossibility) of defining the limits of habitat areas, impact areas, the overall volume of the habitat area, and the numbers of Blindcats present within the aquifer. Wells of equal diameter and pumping rates will have different ability to capture Blindcats based on the number and size of conduits intercepted by the well boreholes.

Borehole diameters for potentially active wells within the Immediate Area Analysis Units and Potential Area of Occurrence described in Appendix B of the SSA range in diameter from 5 to 24 inches, with a mean of approximately 12 inches. Reported yields average 2,802 gpm. Therefore, velocities of water moving up through the casing when wells are pumped or allowed to flow under artesian pressure range from 0.02 fps to 13.1 fps, with an average of 4.99 fps. Review of Texas Water Development Board (TWDB) plugging reports reveal 12 of the 80 wells identified in Appendix B have been plugged, which leaves 68 wells within the Potential Area of Occurrence that might remain active.

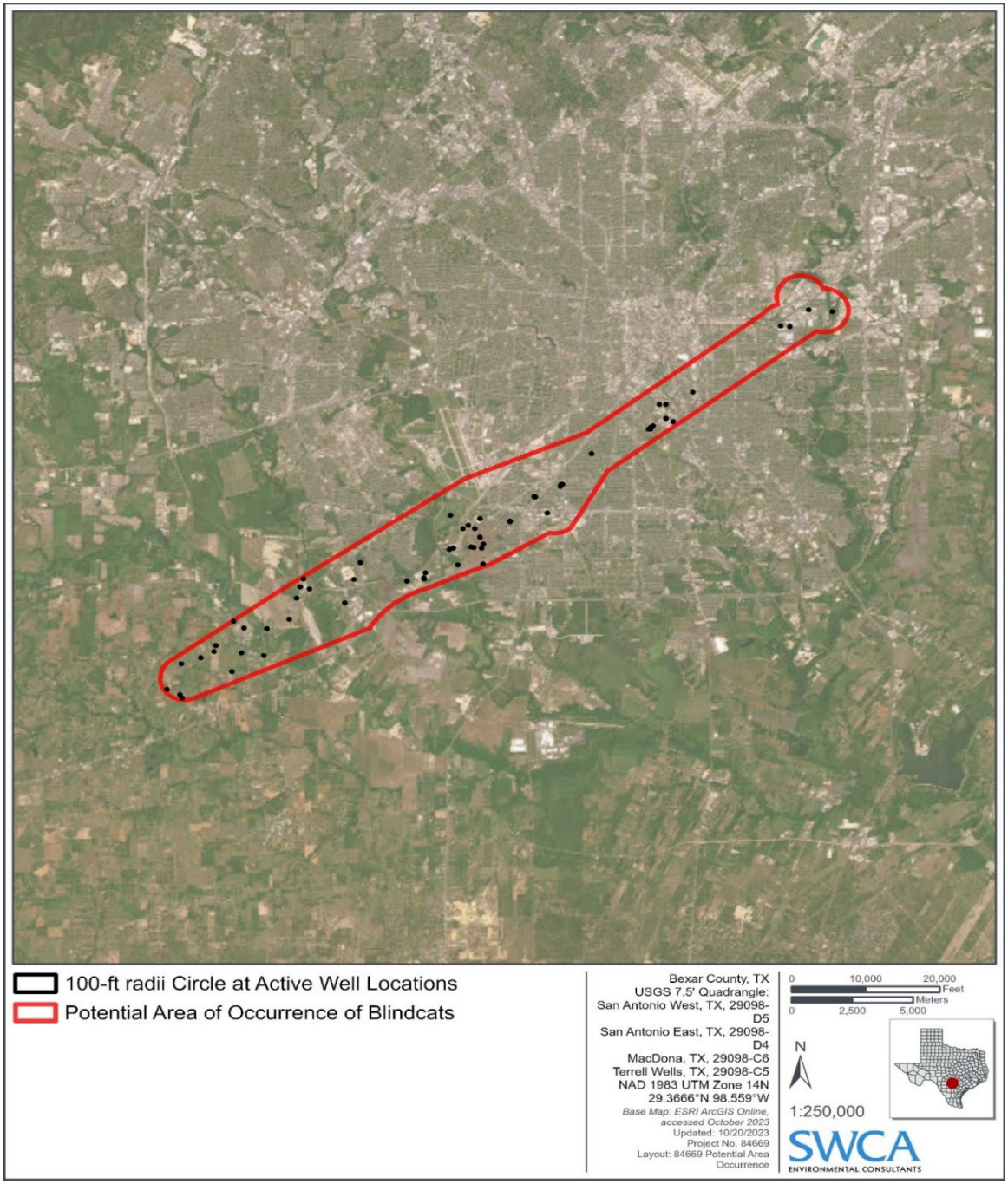
TWDB well reports are available for 6 of the 11 wells with documented Blindcat presence. Four of those wells (ID Nos. 6837508, 6843601, 6843607, 6843802) have yield and casing diameter information. Assuming the lower open hole diameter is the same as the lower casing diameter, the velocities of water moving up through the casing when wells are pumped or allowed to flow under artesian pressure range from 5 fps to 22.7 fps, with an average of 10.7 fps, which is higher than the average of wells within the SSA Potential Area of Occurrence. This suggests that Blindcats may only be captured when up-hole velocities are 5 fps or greater. Only 21 wells within the Potential Area of Occurrence have up-hole velocities greater than 5 fps, based on TWPD well yield and casing or borehole diameter information.

H. Influences of well pumping on Blindcat habitat.

The hydraulic conductivity values for the Edwards Aquifer within the SSA Potential Area of Occurrence ranges from 1,000 to 7,347 ft per day, and the aquifer is roughly 550 feet thick, which equates to a transmissivity range of 550,000 to 4,040,850 cubic feet per day. The storativity value used for aquifer modeling by the USGS (Lindgren 2004) for that area of the aquifer was 8.75 x 10-7. Using a transmissivity value of 2,000 feet per day, a storativity value of 8.75 x 10-7, and a pumping rate of 2,908 gpm, which is the average of wells within the SSA Potential Area of Concern, pumping a well for one full year would be expected to have a drawdown impact of less than 1 feet at a distance of 50 feet from the well. This assumes a homogenous, anisotropic aquifer, which the Edwards karst aquifer is not. However, it still suggests that the distance to which pumping influences water flow within the surrounding aquifer is minimal on average as compared to the size of the Potential Area of Occurrence.

Assuming a 100-foot radius area of influence (i.e., two times the drawdown distance estimated above), the 68 potentially active wells catalogued within the Potential Area of Occurrence in Appendix B of the SSA would collectively influence 49 acres. The total area within the Potential Area of Occurrence is approximately 22,110 acres; therefore, well pumping on average may only affect 0.22 percent of the Potential Area of Occurrence. If the Potential Area of Occurrence is larger than assumed in the SSA, then potential impacts could be less. Figure 9 represents 100-foot radius circles at the locations of the 68 potentially active wells with respect to the Potential Area of Occurrence.

Figure 9. 100-ft radii circles at Potentially Active Well Locations within the SSA Potential Area of Occurrence



I. Well construction as it relates to Blindcat impacts.

Water wells drilled within the artesian zone of the Edwards Aquifer are drilled through hundreds of feet of rock overlying the aquifer itself. Casing is set from the land surface down through the overlying rock and into the top of the aquifer. After the casing is set, the borehole is drilled through the aquifer rock (Edwards Group) until adequate water yield is achieved or the bottom of the aquifer is reached. Because of artesian pressure, water levels rise up to levels near the land surface or in some places flow above the land surface. For that reason, pump impellers

are set at shallow depths near the land surface, and do not need to be set deep. None of the wells drilled within the Immediate Area Analysis Units and Potential Area of Occurrence included in Appendix B of the SSA (SSA 2022) have pump impellers set down below the casing within the open hole portion of the wells. Therefore, in order for a Blindcat reach pump impellers, it would need to enter the well borehole down within the aquifer and rise up hundreds of feet to the pump impellers.

Many wells drilled into the aquifer are not drilled through the entire thickness of the aquifer, as demonstrated by the construction information (TWDB 2023) for wells included in Appendix B of the SSA (SSA 2022). Because many wells drilled into the aquifer do not fully penetrate the aquifer, it is possible the lateral extent of habitat has been underestimated because the Blindcats are present in deeper portions of the aquifer lower than the wells have reached.

J. SAWS has been a robust partner in regional efforts to conserve the Edwards Aquifer.

SAWS has engaged in numerous efforts to manage and conserve the Edwards Aquifer. USFWS acknowledges the conservation value of some of these efforts, but not all. Nor does USFWS consider at all how these conservation measures contribute positively to the resiliency of Blindcat populations, despite speculating about aspects of analysis that might suggest lower resiliency.

(i) Well Capping Efforts

The City of San Antonio and SAWS have proactively addressed wasteful water use activities, the most significant being an artesian well on the Living Waters Artesian Springs Catfish Farm, which was capable of producing about 45 million gallons of water per day from the Edwards Aquifer -- enough water to serve 250,000 people. This well was developed prior to creation of the Edwards Aquifer Authority, and due to state right of capture laws, well owners could assert the right to as much water as they could produce from a well on their property. To terminate this egregious waste, SAWS bought out the landowner and permanently capped the well in 2018 (San Antonio Express News 2018). It is not known if Blindcats were ever discharged through this highly productive well. But, capping this well removed a significant use of groundwater from the San Antonio pool under artesian pressure.

(ii) SAWS Abandoned Well Program

Abandoned water wells are wells in deteriorated condition which may pose a threat to Edwards Aquifer water quality by providing a direct conduit for contaminants to reach the water supply. Abandoned artesian wells may also waste large amounts of water. The SAWS Groundwater Resource Protection Division is aggressive in its pursuit of identifying abandoned wells and closing them. Through the SAWS Abandoned Well Program, SAWS routinely oversees the plugging of approximately 70 abandoned wells per year (SAWS 2023a).

(iii) Edwards Aquifer Habitat Conservation Plan (EAHCP)

The City of San Antonio, through SAWS, is a permittee under the EAHCP, and the SAWS ASR program is considered a spring-flow conservation measure within the EAHCP to maintain desired flow at the San Marcos and Comal Springs. The EAHCP also includes critical period/drought management triggers based on levels measured in the J-17 Bexar Index Well. The Stage 1 critical period/drought management trigger in the San Antonio pool requires Edwards Aquifer groundwater withdrawal permit holders withdrawing from the San Antonio Pool to reduce their annual authorized amount by 20 percent. The Stage 2 critical period/drought management trigger requires 30 percent reductions for users of the San Antonio Pool. SAWS implements water use restrictions for its customers based on Edwards Aquifer levels and drought management triggers, and both year-round watering rules and drought management restrictions are encoded in San Antonio city ordinance, last updated in 2014.

Another SAWS/EAA conservation measure within the EAHCP is the Voluntary Irrigation Suspension Program Option (VISPO). VISPO is an irrigation suspension program that provides compensation for irrigation permit holders and pays an additional suspension rate in years where irrigation suspension is required (based on J-17 Index Well levels). The VISPO enrollment goal is 41,795 acre-feet of irrigation water (EAA 2023).

As stated in the Proposal, "The voluntary minimization and mitigation measures of the plan are based on maintaining sufficient minimum flows at Comal Spring and San Marcos Spring to sustain listed species during a reoccurrence of prolonged drought conditions (National Research Council 2015, pp. 32–36; National Academies of Sciences, Engineering, and Medicine 2018, pp.67–68; Service 2022, p. 64). A review of the Edwards Aquifer Habitat Conservation Plan suggests that flow protection measures, including groundwater modeling efforts, appear to be effective in meeting flow requirements of covered species (National Academies of Sciences, Engineering, and Medicine 2018, pp. 7–8, 109, 152). Additionally, volumes of groundwater pumped from the San Antonio segment of the Edwards Aquifer have decreased since 2008 (Service 2022, pp. 64–65)." Also as stated in the Proposal, "The toothless blindcat and widemouth blindcat are not included in the habitat conservation plan because the plan's actions are most applicable to spring-dwelling species that inhabit upper portions of the Edwards Aquifer (RECON Environmental, Inc., pp. 1–9). However, protection of sustained flow at the Comal Spring and San Marcos Spring systems does provide overarching protection for species that inhabit deep portions of the San Antonio segment. Persistence of surface discharge at those spring systems suggests that deeper levels of the aquifer have not been appreciably reduced and remain water-saturated (Maclay 1995, pp. 48, 52; Lindgren et al. 2004, 40–41,45)."

While USFWS has determined that habitat loss is not a threat to the species (i.e., the deep aquifer remains saturated and not at risk for depletion), the groundwater reduction measures of the EAHCP also reduce the risk of well mortality. USFWS does not consider how reduced pumping has improved the likely resiliency of the Blindcats over time.

(iv) SAWS Water Conservation and Water Supply Diversification

Because of San Antonio's long-standing commitment and investment in water conservation and infrastructure improvements, SAWS' total per capita water consumption has decreased

significantly from 225 gallons per capita per day (GPCD) in 1982 to 117 GPCD in 2016, and 111 GPCD in 2021, which has resulted in approximately 3.2 million acre-feet of cumulative savings. SAWS has successfully cultivated a very strong local ethic of water conservation and has invested in infrastructure to effectively reduce GPCD water use by approximately 50 percent between 1982 and 2016, all while SAWS' service area population grew by approximately 150 percent (SAWS 2017).

Since the early 2000s, SAWS implemented a robust water supply diversification program which has decreased reliance on the Edwards Aquifer (SAWS 2023). Current non-Edwards Aquifer sources are:

- Trinity Aquifer
- Carrizo Aquifer
    - Local Carrizo Project
    - Regional Carrizo Project
        - Schertz-Seguin Local Government Corporation
        - Buckhorn well field
    - Canyon Regional Water Authority Wells Ranch Project
- Simsboro Aquifer
    - Vista Ridge Project (includes both Carrizo and Simsboro water)
- Wilcox Aquifer
    - Brackish Groundwater Desalination
- Canyon Lake
- Lake Dunlap
- Recycled Water Program (initiated in 1996, up to 25,000 ac-ft per year) + recycled water used for electrical generation.

In addition to the non-Edwards Aquifer sources, the ASR program described above enables storage of excess Edwards Aquifer water during wetter periods. This program began production in 2004 and has a planned total storage capacity of 200,000 ac-ft (SAWS 2023b).

Water conservation continues to be a strategy for long-term water supply. New water conservation investments are projected to result in approximately 4.3 million acre-feet of cumulative water savings by 2070 and will replace the need for approximately 132,000 acre-feet per year of new water projects (SAWS 2017).

To summarize the impact of SAWS investment in water conservation and water supply improvements, in 2000, approximately 70% of the SAWS water supply was from the Edwards Aquifer. In 2022, the proportion of SAWS water supply from the Edwards Aquifer comprised 47% of the SAWS water supply (SAWS 2023b) and is planned to continue to drop to 31% by 2070 (SAWS 2017).

K. Water Loss Program

As described in the SAWS 2019 5-Year Water Conservation Plan, the SAWS water loss control strategy includes conducting annual water loss audits to compile and analyze metering data to determine the most effective investments in technology, infrastructure improvements, and maintenance measures to control water loss (SAWS 2019). Strategies include proactive leak detection, loss testing, water main repair and replacement, and implementation of enhanced metering options.

IV. Conclusion

The Proposal relies on the cumulative effect of compounding assumptions, estimates, and hypotheticals to derive a determination that only seeks to interpret each potential variable in a manner that overemphasizes highly speculative harm at every turn. This bias leads to a conclusion and recommendation for listing that is unsupported by the scientific record and is in contravention of the legal principles applicable to this type of agency action. Respectfully, for the foregoing reasons, the Proposal fails in all respects and should be withdrawn. Should you have any questions about the information included in this document, please contact me by email at Edward.Guzman@saws.org or by phone (210) 233-3858.

Sincerely,

SAN ANTONIO WATER SYSTEM

Edward F. Guzman
Vice President
Environmental Law & Regulatory Compliance

Encl. Attachment A – Letter Request for Extension dated October 12, 2023

Attachment B – Additional References

cc: Martha Williams - *Via E-mail: martha_williams@fws.gov*
Director, U.S. Fish and Wildlife Service
Department of the Interior
1849 C Street, NW - MIB Rm 3148
Washington, DC 20240

Amy Lueders - *Via e-mail:* amy_lueders@fws.gov
Regional Director, Southwest Region
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500 Gold Ave. SW
Albuquerque, NM 87102

Karen Myers - *Via e-mail:* karen_myers@fws.gov
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Austin Ecological Services Field Office
1505 Ferguson Lane
Austin, TX 78754

ATTACHMENT A

REQUEST FOR EXTENSION

Edward F. Guzman
Vice President | Environmental Law & Regulatory Compliance
edward.guzman@saws.org | Direct Line 210.233.3858

October 12, 2023

Martha Williams
Director, U.S. Fish and Wildlife Service
Department of the Interior
1849 C Street, NW - MIB Rm 3148
Washington, DC 20240

Via E-mail and regular mail:
martha_williams@fws.gov

RE: Request for 90-day Extension of Comment Period for Proposed Listing of the Widemouth Blindcat and Toothless Blindcat cavefish species under the Endangered Species Act of 1973 (Docket No. FWS-R2-ES-2023-0069)

Director Williams,

The San Antonio Water System (SAWS) is an agency of the City of San Antonio, and thus a government entity, and a public water system providing vital services to over two million people. SAWS is significantly concerned about the proposed listing of the widemouth and toothless blindcat species as well as the United States Fish and Wildlife Service's (the "Service") recent Species Status Assessment of these species. The proposed listing has the potential to impact vital components of the SAWS system and its customers, as well as jeopardize the renewal process of the currently existing Edwards Aquifer Habitat Conservation Plan (the "EAHCP"). The EAHCP is a nationally recognized award-winning habitat conservation plan approved by the Service as a regional plan to ensure the protection of eight federally listed endangered species and three non-listed species associated with the Edwards Aquifer while helping to ensure its stability as a regional water supply and critical river flows. As a member of both the EAHCP Stakeholder and Implementing Committees, SAWS actively participates in regional planning and efforts to support and protect the species and the Edwards Aquifer.

As you may be aware, upon our learning of the proposal, we moved as quickly as we could, and in coordination with the Edwards Aquifer Authority, reached out to the Service in a meeting on September 27th. This proactive approach is reflective of our long history of working with the Service towards the conservation of rare species. We are proud to have been a good and diligent partner in that regard. Included among our efforts are the following:

- SAWS is a signatory to the Edwards Aquifer Habitat Conservation Plan and SAWS' Aquifer Storage and Recovery system is a central conservation element of that plan by storing Edwards Aquifer water for use during times of forbearance triggered by certain drought conditions.
- SAWS has sponsored numerous nationally recognized water conservation strategies and municipal regulations and such strategies and water savings are memorialized in the SAWS Water Management Plan, as well as the state water plan.
- SAWS water supply diversification efforts include 7 other supplies outside of the Edwards Aquifer, including the largest water public-private partnership in the Vista

Ridge Pipeline to bring large amounts of non-Edwards Aquifer water to the region and that project itself underwent consultation with the Service under the ESA.

- SAWS also obtained from USFWS an incidental take permit for its Anderson/Micron water transmission main and provided as mitigation over 57.5 acres of high quality karst invertebrate habitat.
- SAWS has also committed to dedicating 50,000 acre feet of privately-owned groundwater based wastewater effluent for environmental flow purposes in the Guadalupe and San Antonio river basins through efforts to obtain a bed and banks permit for SAWS' discharged wastewater effluent.

All of these efforts have been undertaken over many years and cost billions of dollars, which cost is ultimately borne by SAWS' customers.

The proposed listing focuses on the pumping of groundwater in Bexar County, Texas, but fails to take into account the complexity of the SAWS system and its critical role in the Edward Aquifer Habitat Conservation Plan. Specifically, the assessment of potential impacts of the proposed listing is a serious undertaking considering the SAWS system is one of the most complex and decentralized systems in the nation, with an infrastructure that is not interconnected throughout the system. Further, coordination and collaboration with our partners in the Edwards Aquifer Habitat Conservation Plan is vital as this proposed listing comes at a time when the EAHCP is beginning its renewal process. As proposed, the proposed listing of the widemouth and toothless blindcat species reaches beyond its referenced geographic limits and instead impacts regional entities and stakeholders.

SAWS had no notification of if or when such a proposal might be published, and we note that as a 12-month finding it is approximately 13 years past the statutory deadline triggered by the 2009 positive 90-day finding. Given the potential significance of the proposed listing of the widemouth and toothless blindcat species and the fact that it could adversely affect SAWS' absolutely critical health and safety service to residents and businesses of the 7th largest city in the United States and 2nd largest in Texas, the provision of potable water to military bases and installations, the production of electricity in a fragile Texas power grid, and undermine the already existing and widely successful EAHCP, SAWS assumes the Service would be quite willing to extend the comment period to afford an adequate amount of time to allow SAWS to fully develop and submit thorough and meaningful comments regarding the proposed listing of the widemouth and toothless blindcat species.

Finally, the lack of information on the widemouth and toothless blindcat species habitat has caused SAWS to evaluate whether there are technologies that can be brought to bear to allow the Service or other entities to gather tangible and credible information on the species and their habitat. This pursuit has become all the more necessary in light of the fact that our analysis to date reveals significant disagreement regarding the sufficiency and accuracy of the scientific data upon which the proposed listing is based. If an extension of the comment period is granted, SAWS intends to undertake a robust assessment of what technologies may be available and their suitability and effectiveness for these purposes.

SAWS is confident that the Service can appreciate that it is time-consuming to organize our relevant staff expertise, review, and analyze the thousands of pages of information contained in the proposal, the prior regulatory and status assessing actions, the Species Status Assessment, the peer reviews, and the scientific literature. In addition to organizing and engaging SAWS' own staff that must now focus on this rather than their full-time jobs providing for the health and safety of the community, the unusual and specific nature of the proposal required SAWS to retain qualified consulting experts for assistance. As a government entity, this process takes time and careful consideration.

Based on the above, SAWS believes that a 90-day extension of the comment period for this proposed listing of the widemouth and toothless blindcats that is currently scheduled to close on October 23, 2023 is fair and reasonable. Additionally, as stated above, based upon our analysis to date, we are certain there is substantial disagreement regarding the sufficiency or accuracy of the scientific data, and we therefore urge the Service to extend its one-year deadline for final action on the proposal for a period of 6 months.

Sincerely,

SAN ANTONIO WATER SYSTEM

Edward F. Guzman
Vice President
Environmental Law & Regulatory Compliance

CC: Amy Lueders
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Karen Myers,
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ATTACHMENT B

ADDITIONAL REFERENCES

Edwards Aquifer Authority. 2023. Voluntary irrigation suspension program option. Available at: https://www.edwardsaquifer.org/business-center/groundwater-permit-holder/permit-holder-programs/voluntary-irrigation-suspension-program-option-vispo/. Accessed October 2023.

San Antonio Express News. 2018. San Antonio's infamous catfish farm's well to be capped. Available at: https://www.expressnews.com/news/local/article/Catfish-farm-water-well-to-be-finally-capped-13442390.php. Accessed October 2023.

San Antonio Water System. 2017. 2017 Water Management Plan. Available at: https://www.saws.org/wp-content/uploads/2019/02/20171107_SAWS-2017-Water-Management-Plan.pdf . Accessed October 2023.

San Antonio Water System. 2019. 2019 5-year water conservation plan. Available at: https://www.saws.org/conservation/conservation-conservation-plan/. Accessed October 2023.

San Antonio Water System. 2023a. SAWS abandoned well program. Available at: https://www.saws.org/protecting-our-environment/water-resource-compliance-protection/groundwater_protection/source_water_program/abandon_well/?preview=true Accessed October 2023.

San Antonio Water System. 2023b. Your water – water supplies. Available at: https://www.saws.org/your-water/management-sources/. Accessed October 2023.

Appendix D9 | **CPS Energy's Comments on USFWS's Proposed Rule for the Blindcats**

October 23, 2023

Public Comments Processing
U.S. Fish and Wildlife Service, MS: PRB/3W
5275 Leesburg Pike
Falls Church, VA 22041-3803
Attn: Martha Williams, Director

Re: FWS-R2-ES-2023-0069, Endangered and Threatened Wildlife and Plants; Endangered Species Status for Toothless Blindcat and Widemouth Blindcat, 88 Fed. Reg. 57,046 (August 22, 2023)

Dear Director Williams,

I write on behalf of CPS Energy regarding the announcement published in the Federal Register on August 21, 2023 (Docket #FWS-R2-ES-2023-0069) announcing the intent of the U.S. Fish and Wildlife Service (FWS) to list two species of catfish in the San Antonio Region as Endangered. The two species are known as the Toothless Blindcat (Togloglanis patersoni) and the Widemouth Blindcat (Satan eurystomus).

CPS Energy is the nation's largest public power company with combined natural gas and electric service, providing safe, reliable, and competitively priced service to more than 930,114 electric and 381,379 natural gas customers in San Antonio and portions of seven adjoining counties. We are proud of the partnership and collaboration we have with the San Antonio Water System (SAWS) and the City of San Antonio to foster and protect the health, safety, and prosperity of our residents and environment.

As you know, South Texas is home to many endangered species and our Greater San Antonio community takes pride in the progress we made toward the conservation and protection of these species. The Edwards Aquifer is unique in that a regulatory entity exists and is dedicated to this body of water. Since 2013, stakeholders in the San Antonio region have had an agreement in place known as the Edwards Aquifer Habitat Conservation Plan (EAHCP) that represents an agreement among many disparate and often conflicting equities in the region. The EAHCP, facilitated through legislation passed by the Texas Legislature in 2007, ensures the survival of 13 endangered, threatened, and candidate species in the Comal and San Marcos Springs which are fed by the Edwards Aquifer.

Given that it is necessary to pump water into storage for future use as a water source to facilitate the preservation of these 13 species, we are concerned that the potential follow-on actions regarding the Widemouth Blindcat and Toothless Blindcat listings directly conflict with the EAHCP, putting at risk a carefully crafted resolution to decades of disputes. Further, an endangered designation may require disruptions to pumping in highly populated areas in San Antonio and Bexar County, negatively impacting the reliability of the water and electrical service in those areas. Specifically, the water pumping station in the areas identified by the Service specifically provide process water to our CPS Energy power plants at Braunig and Calaveras lakes. Disrupting the key water source to these plants will put at risk a major source of electricity to the Electric Reliability Council of Texas (ERCOT) market.

The Endangered Species Act requires that listing determinations are made using the best science and commercial information available. However, we are concerned that this standard has not been met and that these species listings have been made prematurely and without a full evaluation of all necessary data. FWS assumes that these two species are being driven to extinction entirely due to the pumping of water, even though little is known about them, their habitat, population size, or reproductive rates. For example, neither species of catfish have been observed in their native habitat and almost all data about the species is extrapolated from knowledge of other fish species or inferred from knowledge regarding salamanders. Nothing is known about the size of the population and assumptions about the size of the habitat come from a total of eight wells despite the vast size of the Edwards Aquifer. Many of these wells are no longer in production and one species has not been seen since 1984.

In closing, the August 21 filing relies almost exclusively upon assumptions involving the habitat, lifecycle, population size, and reproduction rates of these catfish species. Given such a potentially enormous impact to our community's environment and population, more studies would need to be pursued to secure additional data before immediately jumping to the conclusions that these species are endangered. I urge a pause and reassessment of your process including further outreach to the affected stakeholders.

Sincerely,

Curt D. Brockmann
Vice President, Compliance & Ethics