BACKGROUND INFORMATION
Section 4(f)(1)(B)(ii) of the Endangered Species Act (Act) requires that each recovery plan shall incorporate, to the maximum extent practicable, “objective, measurable criteria which, when met, would result in a determination...that the species be removed from the list.” It is possible that for some species, however, delisting cannot be foreseen at the time a recovery plan is written. In some rare cases, the best available information is so seriously limited that it is truly not possible to identify delisting criteria. This would be an unusual case, such as one in which the species’ threats are not understood well enough to identify priorities and appropriate actions to remove (or offset) the threats. For example, the natural habitat may have been so reduced for an endangered species that captive propagation and active management is necessary for the life of a reasonable recovery plan. In another example, the population of a long-lived, slow growing species may be so depleted that possible recovery may be beyond the life of a reasonable recovery plan.

A 2006 Government Accountability Office (GAO) audit of the National Marine Fisheries Service’s (NMFS) and U.S. Fish and Wildlife Service’s (USFWS) endangered species recovery programs recommended that the Secretaries of the Department of Commerce and the Interior direct their staff to ensure that all new and revised recovery plans have either recovery criteria evidencing consideration of all five delisting factors or a statement regarding why it is impracticable to do so (GAO 2006). Since the 2006 GAO audit, we have updated our recovery planning and implementation guidance (NMFS and USFWS 2010), and new plans have included determinations regarding the feasibility or possibility of incorporating delisting criteria related to each of the five factors, as recommended by the GAO. Active recovery plans remain, however, that lack delisting criteria and contain either an incomplete determination regarding the practicability of incorporating delisting criteria, or are silent about the absence of delisting criteria in the recovery plan. In this document, we clarify why it remains impracticable to incorporate delisting criteria for the Comanche Springs pupfish in the Comanche Springs Pupfish Recovery Plan (Recovery Plan).
METHODOLOGY USED TO COMPLETE THE FINDING

This review was conducted by Austin Ecological Services Field Office (ESFO) staff using information from the original listing of the Comanche Springs pupfish under the Endangered Species Preservation Act (32 FR 4001), the Recovery Plan (USFWS 1981, entire), the Comanche Springs pupfish 5-year status review (USFWS 2013, entire), and other published and unpublished sources, as listed below.

FINDING

The Comanche Springs pupfish is only known to occur in the San Solomon Spring system (i.e., San Solomon, Giffin, Phantom Lake, and East Sandia springs) in Reeves and Jeff Davis counties, Texas. The best available scientific information indicates that the primary threats to the Comanche Springs pupfish are 1) habitat loss from the loss of spring flow due to a decline in groundwater levels (USFWS 2013, p. 18), and 2) hybridization from presumed bait bucket releases into occupied Comanche Springs pupfish habitats and/or competition for food, shelter, and other critical resource needs with the invasive sheepshead minnow (Cyprinodon variegatus) (Echelle and Echelle 1994, p. 596; USFWS 1981, p.5).

The information reviewed indicates that impacts to spring flows from a significant increase in groundwater use or declines in recharge are likely to occur in the upcoming decades (USFWS 2013, pp. 18-20). Many springs in the area with similar groundwater sources have failed in the past 50 years, and most of the remaining springs have shown declining trends in outflow. Of the known Comanche Springs pupfish populations, the Phantom Lake Spring population is considered genetically unique (Echelle et al. 1987, pp. 679-680); however, this spring has gone dry since development of the 1981 Recovery Plan and is currently being maintained artificially by a pump system. Although this genetically unique population of pupfish was preserved and is currently stable, any catastrophic event to the artificial pumping system, surface ciénega habitat (such as a flood event or introduction of sheepshead minnow), or further decline in the aquifer level where water is pumped to maintain the surface habitat could cause the permanent loss of this population (USFWS 2013, pp. 18-20, 27). Therefore, the magnitude of impact on Comanche Springs pupfish from declines or loss of spring flow is extremely high because its range is limited to a few small locations and any resulting habitat modification could result in additional local extirpations and eventual extinction. Recent conservation efforts, such as the creation and/or restoration of ciénega refugium and surface habitats at Balmorhea State Park (San Solomon Spring) and Phantom Lake Spring (Garrett 2003, pp. 153-155) have been undertaken. However, the benefits of such actions would be negated if spring flows in these systems continue their historically declining trend (USFWS 2013, pp. 18-20). Currently there are two facilities, the Uvalde National Fish Hatchery and the Southwestern Native Aquatic Research and Recovery Center, which maintain captive brood stocks. These facilities, however, cannot help maintain and/or re-establish wild populations if sufficient habitat is not available.

The threats associated with hybridization and competition are due to the presence of the non-native sheepshead minnow. If this species were introduced into any of the springs within the San Solomon Spring system, the Comanche Springs pupfish populations there could be lost, similar to the outcome of Pecos pupfish (Cyprinodon pecoensis) and Leon Springs pupfish (Cyprinodon bovinus) populations when they encountered sheepshead minnow introductions.
After introduction of sheepshead minnow, the entire Pecos River population of Pecos pupfish was eliminated and replaced in less than 5 years by a hybrid swarm (Echelle and Connor 1989, p. 10). Similarly, the Leon Springs pupfish population within the Diamond Y Spring system in Pecos County, Texas, was partially lost in the late 1980s, and completely lost in the wild due to introgression with sheepshead minnow in the late 1990s. Only through extensive eradication efforts of the invasive genome and the restocking of the system with pure-strain captive stock was the species preserved (Echelle et al. 2004, entire). Eradication efforts for removing sheepshead minnow once introduced into a system is very difficult. Because a system is normally treated with a piscicide (fish poison) which is non-species specific, the poison will eliminate most other fish and potentially impact the invertebrate and plant communities within that system as well. Depending on the system being treated, the piscicide may not be 100 percent effective at removing all of the target species, even with multiple treatments. This difficulty is compounded in systems like the Diamond Y Spring system and San Solomon Spring system because many other federally listed endangered fish and invertebrate species also occur there. Therefore, the magnitude of the threat due to the potential impact of hybridization of the Comanche Springs pupfish with sheepshead minnow is considered high.

Climate change is another source of potential threats to the species (USFWS 2013, pp. 25-27). Potential impacts associated with future climate change cannot presently be reliably predicted. However, accelerating climate change could exacerbate any of the threats already considered, such as spring flow rates, or could result in new threats not conceived at this time. Either way, subtle but significant changes in the ecosystem of the Comanche Springs pupfish resulting from climate change, such as potential ground water loss, reduced spring flows, or lack of significant aquifer regeneration in the foreseeable future (50 to 100 years) could cause the species’ extinction in the wild due to habitat loss and presents a high magnitude threat.

Additional threats include habitat modification from water quality degradation, local habitat changes, lack of regulatory mechanisms, oil and gas development, invasive snails and their associated gill parasite, and climate change (USFWS 2013, pp. 20-27). None of these concerns acting alone in otherwise robust populations are likely to result in substantial threats to the species, but for small populations or in any combination, these threats could negatively impact the Comanche Springs pupfish.

All of these threats, both primary and secondary, have either stayed constant or increased since the listing of the Comanche Springs pupfish and development of its Recovery Plan in 1981 (USFWS 2013, pp. 28-29). Some of the threats (specifically, increased susceptibility to the gill parasite and climate change) are novel threats that have emerged since development of the Recovery Plan. Although the creation of additional habitat has increased the abundance of pupfish in some populations, the species as a whole remains vulnerable. There may be no other waters in the natural range of the species that may be suitable for relocation or establishment. Survival of the species depends entirely on its success in the San Solomon spring system, an area which is under threats of decreasing spring flows and establishment of non-native sheepshead minnow populations.

**Development of Quantifiable Delisting Criteria “Not Practicable” Finding**
The Recovery Plan does not contain delisting or downlisting criteria. It instead lists three objectives and a more detailed four-point “step-down outline”. The objectives are as follows: (1) to assure perpetuation of the species in its natural habitat; (2) to assure genetic diversity of Comanche Springs pupfish by improving the quality of presently occupied habitats, by increasing the quantity of suitable habitat, and by establishing a sound, continuing program of management and public information; and (3) to downlist the species from endangered to threatened status (Service 1981, pp. 9-10). These goals and objectives have not been met. The Comanche Springs pupfish faces multiple imminent, high magnitude threats, and its entire range is limited to one small spring system. Decreases in spring flow rates, which have and are likely to continue into the future, or any other future events that negatively impact the pupfish could easily result in the complete loss of individual populations or the species in the wild. There are no current existing regulatory mechanisms in place which have any meaningful impact or control over the quantity of water being pumped or removed from the aquifers which support the spring system the species depends on. In addition, there are no currently known suitable areas available where the pupfish can likely be established because it is a very narrow habitat specialist.

The Comanche Springs pupfish recovery team acknowledged in the Recovery Plan that while it may be possible to eventually downlist the species, due to the restricted areas of natural occurrence and continual declining water flow from the springs supporting the habitats of this species, it will likely never be delisted. Since recovery plan development, the primary existing threat of spring flow declines have increased in magnitude over time. Phantom Lake Spring, an important spring system to the species, has previously ceased flowing and is now reliant on an artificial pumping system to maintain suitable habitat for the Comanche Springs pupfish. Several new threats such as oil and gas development, invasive snails and their associated gill parasites, and climate change are additional threats to the species that were never considered by the recovery team.

Therefore, due to the extreme limited range of the species, unmitigated current and future threats to survival, and lack of suitable habitats within the historic range that this species could be reintroduced into, the development of quantifiable delisting recovery criteria is not practicable at this time.

REFERENCES


than 20 years of secondary contact. Copeia 3: 590-597.


