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Peer Review:

50 CFR Part 17, Endangered and Threatened Wildlife and Plants; Remove the Modoc Sucker From the Federal List of Endangered and Threatened Wildlife. Proposed rule and 12-month petition finding; notice of availability of draft post-delisting monitoring plan. Fed. Register. 79 (30) 8656–8667 [2013–0133]

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The expectation for this peer review is to evaluate the scientific merits and shortcomings of each document -- what constitutes the best available scientific information and how it was used. Has anything been overlooked; what is the quality of the data used; is it evaluated correctly; are the conclusions justified; etc. It is based on review of the document, examination of cited literature and other literature pertaining to the Modoc Sucker, and personal experience in conservation of fishes. This review is not intended to provide an opinion on the delisting determination itself.

Note that this reviewer has extensive personal experience with the Modoc Sucker and familiarity with its habitat, having actively worked with the species' conservation, first with USFWS (1998-2004) and continuing independently (2005-present).

General:

The USFWS, USFS, CDFW, private landowners and all the various stakeholders who have been involved in the conservation and recovery of the Modoc Sucker are to be complimented on their efforts, in particular the level of cooperation and collaboration provided by the landowners who act as stewards of Modoc Sucker habitat.

The scientific basis of this proposed rule to delist the Modoc Sucker under the ESA [Rule] is based on assessments of past, current and potential future threats to the species and the response of Modoc Suckers populations to these threats. The principal evidence provided is the status, distribution and resilience of populations and available habitat with regard to the recovery criteria (detailed in the Species Report USFWS 2013 and summarized in the Rule), as well as assessment of threats to its continued existence (see Factors Affecting the Species below).

In general, I find the Rule well-written and based on extensive, well-documented surveys, monitoring and recovery reports, as well as the available scientific literature on Modoc Sucker, a species without a great deal of documentation outside the recovery program, and current survey

results. Much of the support for the status and monitoring of the Modoc Sucker are in the form of unpublished findings, progress reports out of the Modoc Sucker recovery program. These reports are not peer-reviewed outside the agency, however, my examination of the latest reports and familiarity with the work, having written much of it, indicates that it is rigorous and scientifically sound in nature. The status data is inclusive to 2012, presumably due to the administrative time-frame involved in preparation of the Rule; however, I personally carried out field work in most Modoc Sucker streams in 2013 and am aware of no changes in the status as characterized in the Rule.

The basis of this Rule to delist the Modoc Sucker is the assertion that the three recovery (delisting) criteria (listed below) have been met, as well as that no existential threats to the Modoc Sucker exist in the foreseeable future (see Factors Affecting the Species below). The data used for the determination are found in USFWS Species Report and the literature on which it is based (USFWS 2013).

Recovery (Delisting) Criteria:

The delisting criteria are similar to, though more stringent than, the delisting criteria and much of the supporting information is similar, I will review only the delisting criteria.

Recovery (Delisting) objective - 1) The remaining suitable, but presently unoccupied, stream reaches within Turner-Hulbert Creek-Washington Creek and Rush-Johnson Creek drainages must be renovated and restored to Modoc sucker.

The intent of this objective was to address habitat loss and degradation (Factor A) through active restoration. The Rule proposes that this objective has been met, as evidenced by the substantially expanded distribution of Modoc Suckers through nearly all available habitat within occupied drainages, as well as restoration efforts and observed habitat improvements (summarized under Downlisting criteria and USFWS 2013).

The statement that Modoc Suckers are present in only 3.4 mi of available habitat Washington Creek, citing Reid 2008a (Conservation Review), is somewhat inaccurate. It is true that they were encountered in only 3.4 miles during surveys carried out in July 2008 when higher reaches were naturally dry; however, as mentioned in the same survey report, young of the year (indicative of local spawning) have been found (2006) as far upstream as near Loveness Road, the upper limit of potential habitat, earlier in the year when the stream channel still has water, indicating that Modoc Suckers are actually using the entire reach (Reid 2009, p. 11 and Figure 5; note that this citation actually refers to Reid 2008 Population Surveys, as cited in Reid 2008a).

Therefore, I would agree that this objective has been fully met.

Recovery (Delisting) objective - 2) Secure populations of Modoc suckers must be reestablished in at least two other streams outside of the above drainages, but within the historical range.

The intent of this objective was to increase both habitat available and the number of populations, thereby increasing redundancy and resiliency of the Modoc sucker populations.

While the Rule states that Modoc Suckers have been found or established in five new streams, the indicated streams only represent a single new drainage (perhaps a semantic issue). Two of the additional populations occur in Garden Gulch and Coffee-Mill Gulch, both 2nd order tributaries within the Turner Creek drainage. The Goose Basin populations (not recognized at the time of listing) are in Thomas Creek, an unnamed 1st order tributary to Thomas Creek, and Cox Creek, a tributary to Thomas, but itself a large 3-4th order drainage. On the other hand, the populations in Dutch Flat and Rush Creek were not acknowledged in the original listing due to assumptions of introgression with Sacramento Sucker, now known not to be a concern (Reid 2008a). Therefore, these two streams could also be added to the list of additional populations.

Recent Oregon survey data by USFS (2013) was not included. It did not change the distribution, but reaffirmed the presence of Modoc Sucker in upper Thomas Creek, above Cox Flat.

I would agree that the inherent goal of increasing redundancy of Modoc Sucker populations and enhancing resilience to localized events within its historic range has been met.

Recovery (Delisting) objective - 3) All populations must have sustained themselves through a climactic cycle that includes drought and flood events.

The intent of this objective was to indicate that Modoc suckers have sufficient resiliency (number of populations, individuals and suitable habitat) to withstand and recover from environmental variability and stochastic events.

The Modoc Sucker and sufficient habitat in all known populations have apparently persisted through numerous environmental fluctuations since their discovery and since listing under natural conditions without the need for extraordinary management measures to protect them. No populations are subject to significant water withdrawals that would threaten the population, nor are these expected to occur in the foreseeable future.

I would agree that the Modoc Sucker has demonstrated sufficient resiliency to withstand and recover from environmental variability and stochastic events, in keeping with this recovery objective.

Factors Affecting the Species:

A thorough analysis of factors affecting the species and discussion of its current status is detailed in the Species Report (Service 2013). The Rule itself provides a summary of the past, current, and potential threats impacting the Modoc sucker and a discussion of those specifically considered in the original listing or subsequently. These are reviewed below. I am aware of no additional threats.

Erosion and Cattle Grazing (Factor A)

The Rule concludes that grazing and associated habitat effects (especially erosion) do not represent a threat to Modoc Suckers in the foreseeable future. However, it suggests that continued grazing is causing erosion on Turner Creek and represents an adverse effect on sucker populations; no scientific evidence is provided to support this. I would point out that, while I am not recommending excessive grazing or sedimentation, the level of grazing on private lands in

Turner Creek has not been demonstrated to have an adverse effect on the population, and in fact, this reach supports the highest number of suckers in California populations. There is ample spawning habitat available and instream resources support a diverse native fish fauna. Modoc Suckers typically occupy deeper soft-bottomed pools with ample cover and aquatic vegetation, feeding on algae and associated invertebrates. Furthermore, this reach has steadily improved in condition over the last 15 years under current management. The down-cutting observed in the meadow is apparently a legacy effect from a major storm in the 1940-50's that is slowly healing, albeit less rapidly than it would without grazing, but in a steady upward trend.

The extreme downcutting in Dutch Flat is also a legacy effect, in this case early ditching to dry out the meadow. Additional erosion of stream banks is occurring at access points and along fence lines. Grazing here is a concern due to the impacts of cattle on individual small late-summer pools. The occupied reaches are enclosure-fenced, however there are periodic incursions from surrounding lands. Similar impacts were occasionally observed on the very upper reaches of Turner Creek (vicinity of Bark Spring) prior to fencing and changes in grazing management by USFS (pers.obs.).

I would agree that erosion and habitat alteration by grazing does not represent a threat to Modoc Sucker populations under current management and likely to continue into the foreseeable future.

Elimination of Natural Barriers (Factor A)

As presented in the Rule, this was perceived as a threat at the time of listing but is no longer a consideration due both to improved understanding of hybridization in Modoc Suckers and to the fact that there is no evidence that any natural physical barriers ever existed between Modoc and Sacramento suckers (Reid 2008).

Climate Change and Drought (Factor A)

Climate change is beyond my expertise; however, the logic that Modoc Suckers have demonstrated resilience in the face of several major climatic cycles and extreme droughts is reasonable and well-documented.

Predation by Non-native Species (Factor C)

The rule concludes that non-native predators, specifically Largemouth Bass (Turner drainage) and Brown Trout (Rush Creek drainage) while having a negative impact on local populations do not represent an existential threat. This is supported by the successful removal and suppression of the non-native populations in the past and the evidence that Modoc Suckers have demonstrated persistence over a long period of periodic and continual coexistence, respectively.

The Rule does not mention that fish screens have been installed in the upper reaches of Turner (2010) and Washington (2006) creeks to prevent incursion of non-natives from shallow reservoirs on the uplands during most high-water events. Subsequent surveys through 2013 indicate that the screens are effective.

Hybridization and Genetic Introgression (Factor E)

The Rule concludes that hybridization and genetic introgression do not constitute threats to the Modoc sucker now and are not expected to in the future. This is supported in the Rule by several peer-reviewed studies examining the genetics of Modoc Suckers and the

sympatric Sacramento Sucker, which found very low levels of historic introgression and no evidence suggesting recent increases in frequency. Furthermore, genetic methodology and our understanding of genetic interactions between closely related fishes, in particular western suckers, has changed considerably since the time of listing when this threat was conjectural.

For some reason Smith et al. (2011), a peer-reviewed paper with similar conclusions regarding the genetics of Modoc and Sacramento suckers, is not cited in either this Rule or the Species Report.

Literature Cited in this review:

MacKenzie, D. I., J. D. Nichols, M. E. Seamans, and R. Gutierrez. 2009. Modeling species occurrence dynamics with multiple states and imperfect detection. *Ecology* 90:823-835.

Reid, S.B. 2008. Conservation Review: Modoc Sucker, *Catostomus microps*. U.S. Fish and Wildlife, Klamath Falls, OR. 105 pp.

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