



United States Department of the Interior



FISH AND WILDLIFE SERVICE

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In Reply Refer To:
AFWO

Technical Memorandum

TO: Caitlin Bean, CA Department of Fish and Wildlife; AFWO Files

FROM: Damon Goodman and Nicholas J. Hetrick, Arcata Fish and Wildlife Office

SUBJECT: Response to Request for Technical Assistance – Distribution of Pacific Lamprey in the reach immediately downstream of Iron Gate Dam, Klamath River

DATE: September 5, 2017

Purpose. In August 2017, the California Department of Fish and Wildlife submitted a formal request for technical assistance to the Arcata Fish and Wildlife Office Fish, Fisheries and Aquatic Habitat Conservation Program (AFWO) to summarize the current state of knowledge regarding the distribution of Pacific Lamprey (*Entosphenus tridentatus*) ammocoetes in the mainstem Klamath River in the reach downstream of Iron Gate Dam.

Background. In this memorandum, we leverage existing information to evaluate potential mitigation measures regarding Pacific Lamprey proposed in the Klamath Dam Removal Overview Report for the Secretary of the Interior published in 2012, which are currently being considered for implementation as part of an on-going FERC process. The proposed mitigation measure would entail capturing and moving lamprey ammocoetes from the two-mile reach of the mainstem Klamath River located immediately below Iron Gate Dam. This reach was selected as it is anticipated to experience the highest suspended sediment concentrations that would result from reservoir drawdown and subsequent dam removal.

In conducting the assessment, we first describe the river reach targeted by the mitigation measure in the context of lamprey distribution in the Klamath River Basin. We estimated the current habitat available to Pacific Lamprey in the Klamath River basin using the GIS layer “Pacific Lamprey Historic and Current Distribution” (Reid and Goodman 2017). The current distribution of Pacific Lamprey was estimated at over 690 miles in length for streams $\geq 4^{\text{th}}$ order. Therefore the mitigation measure would influence just under 0.3% of current Pacific Lamprey habitat in the Klamath River Basin.

In 2008, USFWS (Bettaso and Goodman 2008) collected lamprey ammocoetes (*Entosphenus spp.*) at 37 locations in the Klamath Basin (Figure 1.). Ammocoetes were collected following standard ammocoete sampling protocols as described by Reid and Goodman (2015). The sampling conducted by Bettaso and Goodman (2008) was conducted as part of an ongoing Klamath Basin contaminant survey and included 37 distinct locations. In the Klamath River, we detected ammocoetes at an expected catch per unit effort at all locations except those in proximity to Iron Gate Dam. We failed to detect ammocoetes at the three sample locations

between Iron Gate Dam and the confluence with the Shasta River. Downstream of the Shasta River we detected lamprey ammocoetes at Trees of Heaven campground, however the catch per unit effort was the lowest observed in the 37 sample units. In the vicinity of the Scott River, catch per unit effort returned to expected levels that aligned with other locations sampled as part of the survey. The only other sites in the study where we failed to detect ammocoetes were located in the lower canyon of the Shasta River. At these sites, approximately 20 Yellow Bullheads (*Ameiurus natalis*) were observed dead, indicating water quality conditions beyond those tolerated by ammocoetes. Observations made during the 2008 survey suggest the reach below Iron Gate Dam targeted for the mitigation does not support a density of lamprey relative to other areas in the Klamath River. As such, the application of this proposed mitigation measure will have no measurable effect on the overall abundance of abundance of Pacific Lamprey in the Klamath River following dam removal.

Also note that the current understanding of lamprey genetics indicate that Pacific Lamprey in the Klamath Basin are part of a more geographically-widespread interbreeding population that exhibits little basin-specific site fidelity (Goodman et al. 2008; Spice et al. 2012). Given that the abundance of Pacific Lamprey in the Klamath Basin will not be measurably affected by the proposed mitigation measure, there will be no measurable decrease in in the more expansive coast-wide population of Pacific Lamprey.

Literature Cited

- Bettaso, J. and D. H. Goodman. 2008. Mercury contamination in two long-lived filter feeders in the Trinity River Basin: A pilot project. U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata Fisheries Technical Report Number TR 2008-09 Arcata, California.
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- Reid, S.B. and D.H. Goodman. 2015. Detectability of Pacific Lamprey occupancy in western drainages: implications for distribution surveys. *Trans. Am. Fish. Soc.* 144:315-322.
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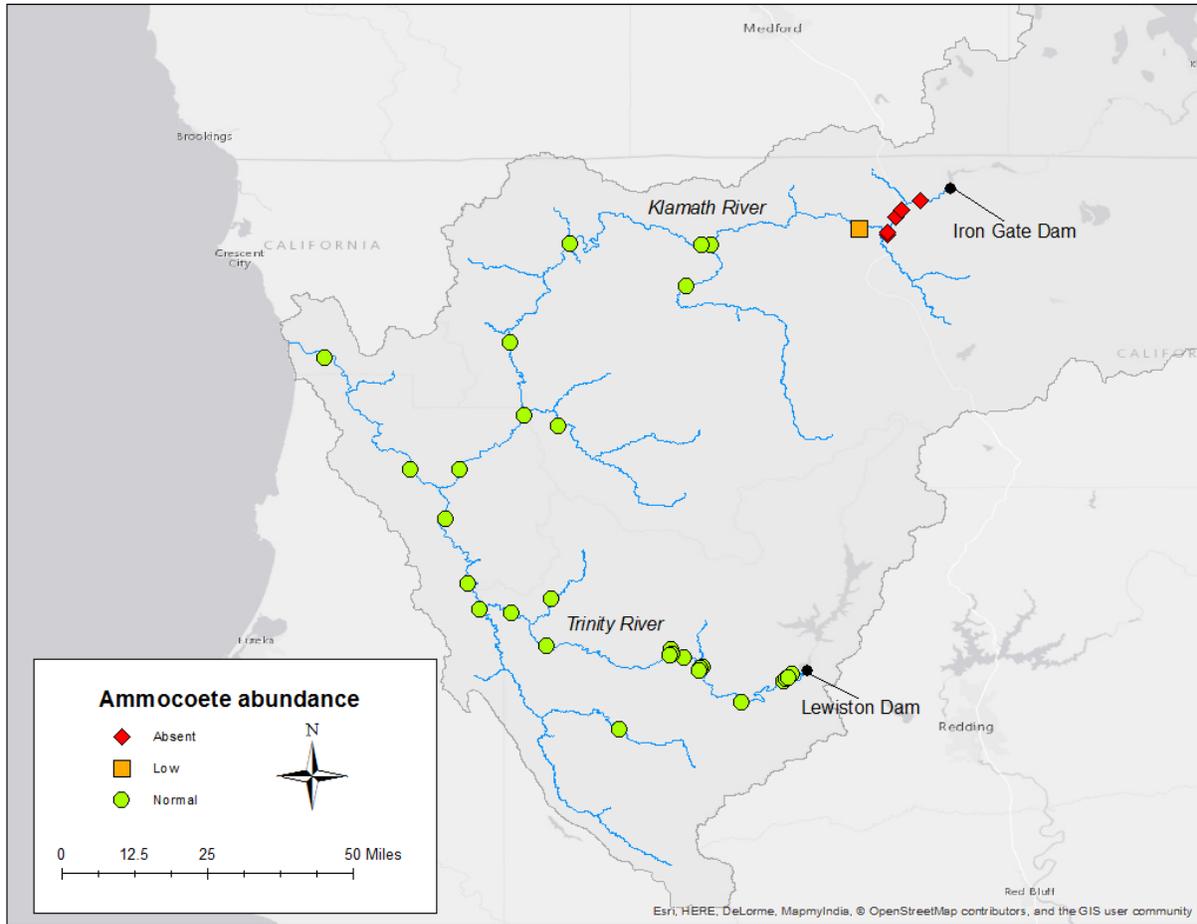


Figure 1. Lamprey ammocoete sample locations and relative abundance. All 37 locations were sampled in 2008 as part of a Klamath Basin contaminant survey.