U.S. Fish and Wildlife Service

Modoc sucker (*Catostomus microps*) Draft Post-Delisting Monitoring Plan

Modoc sucker (*Catostomus microps*). Photo credit: USFWS

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Anti-deficiency Act Disclaimer

Post-delisting monitoring is a cooperative effort between the U.S. Fish and Wildlife Service (Service), state, tribal, and foreign governments; other Federal agencies; and non-governmental partners. Funding of post-delisting monitoring presents a challenge for all partners committed to ensuring the continued viability of the Modoc sucker following removal of Endangered Species Act protections. To the extent feasible, the Service intends to provide funding for post-delisting monitoring activities through the annual appropriations process. Nonetheless, nothing in this Plan should be construed as a commitment or requirement that any Federal agency obligate or pay funds in contravention of the Anti-Deficiency Act, 31 U.S.C. 1341, or any other law or regulation.

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Introduction

Post-delisting monitoring (PDM) refers to activities undertaken to verify that a species delisted due to recovery remains secure from risk of extinction after the protections of the Endangered Species Act (ESA) no longer apply. The primary goal of PDM is to monitor the species to ensure the status does not deteriorate, and if a substantial decline in the species (numbers of individuals or populations) or an increase in threats is detected, to take measures to halt the decline so that re-proposing it as a threatened or endangered species is not needed.

Section 4(g) of ESA requires the U.S. Fish and Wildlife Service (Service) to implement a system in cooperation with the states to monitor, for not less than five years, the status of all species that have recovered and been removed from the list of threatened and endangered plants and animals.

The Service and states have latitude to determine the extent and intensity of PDM that is needed and appropriate. The ESA does not require the development of a formal PDM "plan." However, a written planning document often substantially contributes to the effective implementation of section 4(g) by guiding collection and evaluation of pertinent information over the monitoring period and articulating the associated funding needs. This document was prepared to describe the PDM plan for the Modoc sucker (*Catostomus microps*) and follows the Service's August 2008 "Post-Delisting Monitoring Plan Guidance Under the Endangered Species Act."

Species Listing History

Modoc suckers were listed as endangered in 1985 and critical habitat was designated concurrent with the listing (50 FR 24526, June 11, 1985). The species was listed as endangered because it was believed to have been extirpated from a significant portion of its limited range due to habitat degradation and loss from overgrazing, siltation, and channelization. Loss of genetic integrity of the species due to hybridization with Sacramento suckers (*Catostomus occidentalis*) also was identified as a threat at the time of listing. On February 13, 2014, the Service published a 12-month finding and proposed rule to remove the Modoc sucker from the list (79 FR 8656). The proposal was based on the finding that the best available scientific and commercial information indicated that the Modoc sucker has recovered due to the amelioration of all substantial threats and expansion of the known occupied range of the species. For additional background information on the Modoc sucker, refer to the final listing rule published in the *Federal Register* (50 FR 24526); the 5-year review completed in 2009 (Service 2009); and the proposed delisting rule published in the *Federal Register* on February 13, 2014 (79 FR 8656).

Recovery

Most threats to the Modoc sucker that were considered in the 1985 listing rule have been reduced (habitat degradation resulting from livestock grazing) or are no longer considered to have been actual threats at the time of listing (hybridization). Habitat conditions on both public and private lands have improved since the time of listing as a result of improved grazing management practices and construction of fencing to exclude cattle from riparian areas on several of the streams occupied by Modoc suckers. We expect habitat conditions to remain stable or improve, although recent habitat surveys indicate erosion continues to be a problem along lower Turner

Creek and in Dutch Flat Creek. Modoc suckers have coexisted with brown trout for over 70 years, and the overlap in distribution of largemouth bass and Modoc suckers is limited because bass are warm-water fish that occur in lower-elevation reaches downstream of many of the reaches occupied by Modoc sucker, and reservoir outflows have been screened to reduce the risk of bass being flushed into streams occupied by Modoc sucker. Thus, introduced predators do not appear to be a significant risk to Modoc sucker populations. The known range of the Modoc sucker has increased as a result of the discovery of five populations not known at the time of listing, as well as documentation of the genetic integrity of populations considered in the 1985 listing rule to have been lost due to hybridization. Also, the distribution of occupied stream habitat for populations known at the time of listing has remained stable or expanded slightly since the time of listing, even though the region has experienced several droughts during this time period. A greater understanding of the genetic relationships and natural gene flow between the Modoc suckers and Sacramento suckers has reduced concerns over hybridization between the two naturally sympatric species.

Summary of the Species Status at Time of Delisting

Distribution

At the time of listing in 1985, the Modoc sucker was believed to occupy 12.9 miles (mi) of habitat in the Ash Creek and Turner Creek sub-basins, which are tributaries of the Pit River in Modoc and Lassen Counties, California (50 FR 24526, June 11, 1985). Within the Turner Creek sub-basin, Turner Creek and its tributaries, Washington Creek, and Hulbert Creek were occupied at the time of listing. Within the Ash Creek sub-basin, Johnson Creek was occupied at the time of listing. The final listing rule also recognized that four additional creeks (Ash Creek, Dutch Flat Creek, Rush Creek, and Willow Creek) were occupied historically, but populations were presumed lost due to hybridization with Sacramento suckers (*Catostomus occidentalis*). Although there was no genetic corroboration of hybridization available at that time (Ford 1977; Mills 1980), hybridization was suspected because of overlapping occurrences (50 FR 24526, June 11, 1985).

New information shows that the historical distribution of the Modoc sucker also included the Goose Lake sub-basin in southern Oregon and northern California, which is a disjoined, upstream sub-basin of the Pit River (Reid 2007). Evidence indicates Goose Lake has been hydrologically disconnected from the Pit River since the 1800s because it has only occasionally substantially overflowed into the North Fork of the Pit River (Laird 1971). Although Modoc suckers in California and Oregon are isolated from each other, Modoc suckers in the Goose Lake sub-basin in southern Oregon are morphologically and genetically similar to Modoc suckers in the Turner and Ash Creek sub-basins in northeastern California (Dowling 2005; S. Reid, Western Fishes, unpublished data; Topinka 2006).

The current distribution of the Modoc sucker includes 12 streams in three sub-basins with 42.5 mi of known occupied habitat (Figure 1; Table 1). New information is available that documents the occurrence of additional populations not considered in the original listing. These additional populations are found in Coffee Mill Creek and Garden Gulch Creek in the Turner Creek sub-basin, Thomas Creek in the Goose Lake sub-basin, an unnamed tributary to Thomas Creek in the

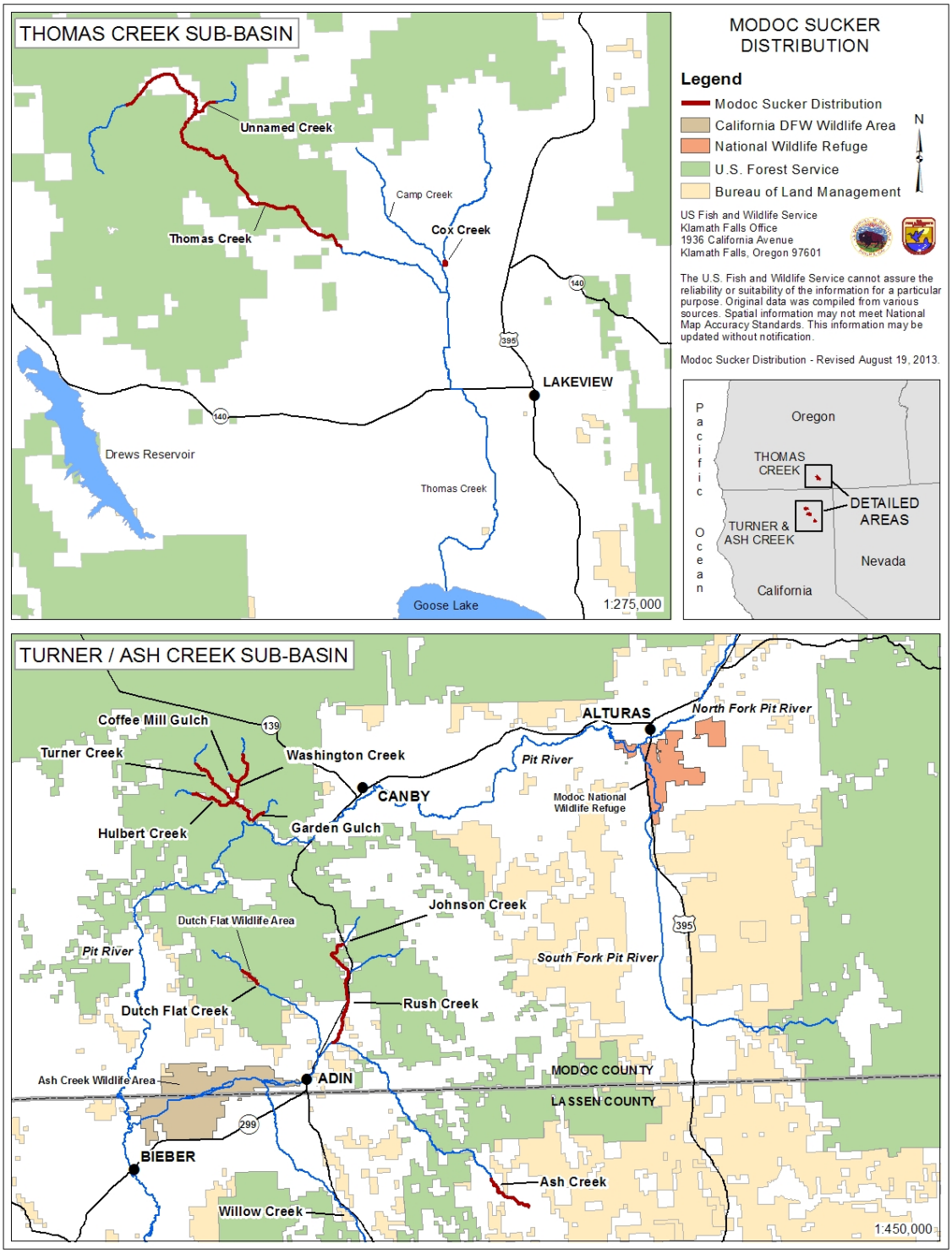

Figure 1. Distribution of Modoc sucker (*Catostomus microps*) in the Goose Lake sub-basin in Oregon (top panel) and the Ash Creek and Turner Creek sub-basins (in California). Areas in green are the Fremont-Winema National Forest (top panel) and the Modoc National Forest (bottom panel). Areas in white indicate private land.

Table 1. Known Modoc sucker (*Catostomus microps*) distribution at the time of listing (1985) and present distribution (based on most recent survey data) within the Turner Creek, Ash Creek, and Goose Lake sub-basins.

Sub-basin	Stream	Distribution at Time of Listing	Present Distribution
Turner Creek	Turner Creek	2.0 mi (3.2 km)	5.5 mi (8.9 km)
	Washington Creek	0.5 mi (0.8 km)	3.4 mi (5.5 km)
	Hulbert Creek	0.8 mi (1.3 km)	3.0 mi (4.8 km)
	Coffee Mill Creek	Historically fishless	0.8 mi (1.3 km)
	Garden Gulch	Unknown	1.0 mi (1.6 km)
Ash Creek	Johnson Creek	1.2 mi (1.9 km)	2.7 mi (4.3 km)
	Rush Creek	4.6 mi (7.4 km)	4.6 mi (7.4 km)
	Dutch Flat Creek	0.1 mi (0.2 km)	1.4 mi (2.3 km)
	Ash Creek	3.7 mi (6.0 km)	Assumed 3.7 mi (6.0 km); no recent survey data
	Willow Creek	Unknown	Not extant
Goose Lake	Thomas Creek	Unknown	15.2 mi (24.5 km)
	Unnamed Tributary to Thomas Creek	Unknown	1.2 mi (1.9 km)
	Cox Creek	Unknown	Only collected at one sample location
Total		*12.9 mi (20.8 km)*	*42.5 mi (68.4 km)*

Goose Lake sub-basin, and Cox Creek in the Goose Lake sub-basin (Figure 1). New genetic information also is available on the four populations (Ash Creek, Dutch Flat Creek, Rush Creek, and Willow Creek) that were considered lost to hybridization in the original listing. This new information suggests that the level of introgression between Modoc suckers and Sacramento sucker may be a natural phenomenon and a part of their evolutionary legacy (see species report for additional information, Service 2013). Throughout the species' current distribution, land ownership at occupied streams is 51 percent Federal, 48 percent private, and 1 percent State.

Habitat

Modoc suckers are primarily found in relatively small (second to fourth order), perennial and intermittent streams. They occupy an intermediate zone between the high-gradient and higher-elevation, coldwater trout zone and the low-gradient and low-elevation, warm-water fish zone. Most streams inhabited by Modoc suckers are characterized by moderate gradient (15 to 50 feet (ft) drop per mile (5 to 15 meter (m) drop per kilometer (km))), low summer flow (1 to 4 cubic ft

per second (0.03 to 0.11 cubic m per second)), and relatively cool (59 to 72 °F (15 to 22 °C)) summer temperatures (Moyle et al. 1982). They are most abundant in pools, especially those deeper than 1 ft (0.3 m). In the Pit River system, Modoc suckers occupy stream reaches above the Sacramento sucker (*Catostomus occidentalis*), Sacramento pikeminnow (*Ptychocheilus grandis*), and hardhead (*Mylopharodon conocephalus*) zone of the main-stem Pit River and the lower reaches of its primary tributaries (Moyle and Marciochi 1975; Moyle et al. 1982). The known elevation range of Modoc suckers is from about 4,200 to 5,000 ft (1,280 to 1,524 m) in the upper Pit River basin (Ash and Turner Creeks) and from about 4,700 to 5,800 ft (1,432 to 1,768 m) in the Goose Lake sub-basin (Reid 2007; 2008a). However, most known populations are constrained by the effective upstream limit of permanent stream habitat.

The pool habitat occupied by Modoc suckers generally includes fine sediments to small cobble bottoms, substantial detritus, and abundant cover. Spawning habitat appears to include gravel substrates in the relatively low energy flowing portions of pools or the protected area downstream of rocks (Reid 2008a). During low summer flows, pools inhabited by Modoc suckers can become isolated, which eliminates interaction of suckers within and among streams. Cover can be provided by overhanging banks, larger rocks, woody debris, and aquatic rooted vegetation or filamentous algae. Larvae occupy shallow vegetated margins, juveniles tend to remain free-swimming in the shallows of large pools, particularly near vegetated areas, and larger juveniles and adults remain mostly on, or close to, the bottom (Martin 1972; Moyle and Marciochi 1975; Moyle 2002).

Residual Issues

While most threats to the Modoc sucker that were considered at the time of listing have been reduced or are no longer considered to have been actual threats, there are some residual stressors that persist that may affect the species. However, these stressors do not constitute threats to the species.

Impacts to Modoc sucker habitat from livestock grazing have been greatly reduced since the time of listing as a result of improved livestock grazing management practices. Land management practices employed on public and private lands since the early 1980s are expected to continue, or improve, thereby maintaining upward habitat trends as documented by Proper Functioning Condition data. Briefly, Proper Functioning Condition is a method of assessing the physical functioning of riparian and wetland areas. Proper Functioning Condition assessment refers to a consistent approach for monitoring hydrology, vegetation, and erosion and deposition attributes and processes to assess the condition of riparian areas. The high level of bank erosion at the parcel of private property on lower Turner Creek and the erosion and riparian fence failure in the Dutch Flat Wildlife Area remain a concern for sediment introduction and degradation of Modoc sucker habitat. Yet, these two degraded reaches combined amount to only 4.1 percent (1.76 mi/42.5 mi) of Modoc sucker's total occupied habitat. Although the 2012 habitat surveys indicate that livestock grazing still results in stream bank erosion along streams occupied by Modoc suckers, recent survey results (2008 and 2012) indicate that livestock grazing has not resulted in reduced distribution of Modoc suckers.

While Modoc suckers may be negatively impacted by introduced predatory fishes, such as brown trout and largemouth bass, they have persisted in the presence of nonnative predators and populations have remained relatively stable in the Ash Creek and Turner Creek sub-basins prior to and since the time of listing. The separation of the three known basins containing Modoc suckers further reduces the probability that a new or existing nonnative predator would impact all three basins simultaneously. In some instances, there are natural constraints that limit the distribution of nonnative predators, such as cool-water habitat. In other cases, natural or manmade barriers limit potential introductions, as do policies and regulations within Oregon and California. Therefore, introduced predators do not appear to significantly affect Modoc sucker populations.

Purpose and Objectives

The purpose of PDM for the Modoc sucker is to monitor the species and its habitat to ensure the status does not deteriorate to a point that re-proposing the species as threatened or endangered under the ESA is necessary. The primary objective of this PDM plan is to monitor the population status of the Modoc sucker to detect any changes that may indicate negative impacts to the continued stability of the species. Monitoring under this plan will focus on Modoc sucker distribution, abundance, and recruitment. These types of surveys may overlap with ongoing surveys for other fish and serve to provide a quick overview of the status of the species. In addition to these surveys, presence of threats will be documented during monitoring.

Implementation

Section 4(g) of the ESA explicitly requires cooperation with states in development and implementation of PDM programs, but the Service remains responsible for compliance with section 4(g) and must remain actively engaged in all phases of PDM. Since Modoc suckers occur on the Modoc National Forest in California and the Fremont-Winema National Forest in Oregon, the Service will implement the PDM plan with the U.S. Forest Service (Forest Service). However, since the species is listed in California as endangered and fully protected and in Oregon as critically sensitive, the Service will also implement the PDM plan in cooperation with the California Department of Fish and Wildlife (CDFW) and the Oregon Department of Fish and Wildlife (ODFW).

Summary of Roles of All Cooperators in the PDM Planning Effort

U.S. Fish and Wildlife Service

The Service will lead efforts to ensure that effective PDM of the Modoc sucker is accomplished through participation in and oversight of all activities implemented in cooperation with the Forest Service, the California Department of Fish and Wildlife and the Oregon Department of Fish and Wildlife. The Service will cooperate with the Forest Service and the States of California and Oregon to identify funding sources of the monitoring activities.

U.S. Forest Service

The Service has requested the Forest Service's assistance in implementing the Modoc sucker PDM plan on both the Modoc National Forest and the Fremont-Winema National Forest. Similar to the Service, the Forest Service is operating during a time of increasingly constrained budgets and limited resources. Assuming available funds, each national forest has committed to continuing to monitor cattle grazing attributes, specifically herbaceous utilization, stubble height, and streambank alteration. As funding permits, the Modoc National Forest may also complete long-term monitoring of habitat conditions as it possesses photo points, cross sections, and other pertinent information.

California Department of Fish and Wildlife

The ESA specifically requires the Service to cooperate with state agencies, including CDFW, when implementing PDM activities. Modoc sucker is listed as endangered and fully protected under the California Endangered Species Act. The majority of the range of Modoc sucker in California occurs on federally and privately owned lands, although the range does occur on the Dutch Flat Wildlife Area, which was created by CDFW in 1983 to prevent degradation of 0.75 mi (1.2 km) of riparian and stream habitat. The Service will cooperate with CDFW to use grant programs and CDFW-administered monies to help fund the PDM activities.

Oregon Department of Fish and Wildlife

The ESA specifically requires the Service to cooperate with state agencies, including ODFW, when implementing PDM activities. Modoc sucker is classified as critically sensitive in Oregon. The range of Modoc sucker in Oregon occurs on federally and privately owned lands. ODFW has completed Modoc sucker monitoring surveys throughout their range in Oregon and these data will be used for PDM comparisons. ODFW has participated in Modoc sucker surveys previously and anticipates continued participation in future surveys. The Service will cooperate with ODFW to use existing grant programs and ODFW-administered monies to help fund the PDM activities.

Monitoring Duration

Although the ESA has a minimum PDM requirement of 5 years, the Service believes that the Modoc sucker should be monitored for 10 years following delisting. A 10-year monitoring period is necessary to account for environmental variability (for example, drought) that may affect the condition of habitat and to provide for a sufficient number of surveys to document any changes in the abundance of the species. Based on the life history of Modoc suckers, in which individuals mature at age 2+ years, a complete survey of previously surveyed areas should be conducted every 2 years within the 10-year monitoring period. This will allow an assessment of changes in abundance over time, indications of any potential range contraction, an assessment of recruitment by observing different size classes of Modoc suckers, and increases in threats to the species. If a substantial decline in abundance is observed or a substantial new threat arises, post-delisting monitoring may be extended or modified.

Monitoring Focus

Occupancy and Abundance Monitoring

A multi-state occupancy approach (MacKenzie et al. 2009) will be used to estimate the proportion of sites occupied, change in site occupancy, and change in abundance of Modoc suckers. Using multiple site visits, this approach accounts for variability in detection probability, a crucial consideration since not all Modoc suckers are detected when surveying.

Data collection entails multiple independent and concurrent surveys at sites within occupied streams during a time of year (late spring and summer) when Modoc suckers are detectable. Survey sites are pools within streams reaches that provide suitable habitat for Modoc suckers; individual streams will have multiple sites. Based on the surveys, sites will be classified as suckers being detected (1 or more suckers observed) or not (0 suckers observed). Each site where suckers are detected will be further classified as a state of low (1 to 9 suckers observed) or high ($\geq$ 10 suckers observed) abundance. The threshold of 10 suckers is based on previously collected data on frequency of observations, which indicates that 10 is a divide between low and high abundance at a site (Reid 2008a). This approach will be useful for monitoring population status over time as it permits the estimation of the proportion of sites (within a stream and among all streams) that are occupied and that are in each state of abundance (low and high). Ideally, proportions would either 1) remain stable or vary minimally over the duration of monitoring, or 2) show an increase in the proportion of sites showing high abundance.

Our survey method is modified from the sampling protocol developed for Modoc sucker (Reid 2008b) that is consistent with the approach used in surveys conducted since 2008; however, three individuals, rather than one, will complete the surveys. Three individuals will be required to provide a desired level of safety that cannot be achieved with just one person. Multiple individuals will conduct independent surveys concurrently (analogous to a site visit) to provide multiple data points to determine the proportion of sites that are occupied and the states of abundance. The three individuals will not disclose their counts of Modoc suckers or estimated fish sizes to each other during the survey. Independent detections at each site are an important requirement of the occupancy modeling approach (MacKenzie et al. 2006).

This sampling protocol is useful as it does not require a large commitment of resources to complete the surveys. Briefly, surveys for Modoc suckers are completed by walking designated stream reaches (see Survey Streams below) at night, enumerating all individuals observed, and estimating their sizes to the nearest centimeter. Since Modoc suckers are active and mobile during the day, it may be difficult to obtain accurate counts and size estimates. However, Modoc suckers are readily visible and lethargic after dusk (Reid 2008b), which permits more precise counts and size estimation than during the day.

Prior to completing surveys, sites (pools) within streams will be landmarked and georeferenced to allow relocation for subsequent surveys. Illumination during night surveys will be provided via a combination of a headlamp and a strong hand-held light (for example, Princeton Tec Miniwave or Torrent LED light). Surveyors unfamiliar with the stream reaches will complete reconnaissance during the day to familiarize themselves with the area.

Threats and Recruitment Monitoring

Threats, both biotic (for example, nonnative predatory fish) and abiotic (for example, excessive sedimentation) will also be assessed during surveys (both day and night). During surveys, we will also monitor recruitment. To measure recruitment, we will estimate the size of individuals to the nearest centimeter. Examination of fish sizes will allow a determination to be made if recruitment is occurring over time. Ideally, surveys will result in diverse size classes of fish, indicating recruitment is occurring.

Survey Streams

All survey streams are located on the Modoc National Forest, Fremont-Winema National Forest, or CDFW lands. The Service will coordinate with the Modoc National Forest, Fremont-Winema National Forest, and the States prior to beginning surveys each year to share anticipated survey dates and ensure there are no potential hazards to surveying (for example, forest fire). Within California, the downstream ends of Turner Creek and Garden Gulch Creek are located on private property. The landowner granted the Service permission to survey these locations in 2012. We will continue to coordinate with the landowner for permission to survey these locations into the future, although there is no guarantee of future access to the property. The following descriptions of survey streams are based on previous surveys (Reid 2008a; b), and future surveys will be as similar as possible to maintain consistency.

Johnson Creek **–** Begin the survey at the gabion fish barrier at the Forest Service lower boundary and proceed upstream to the private boundary fence (about 500 m upstream of the 41N11 Bridge).

Dutch Flat Creek – Begin the survey at the downstream end of the creek at the eastern edge of Section 25 and proceed upstream to the upstream end of the CDFW Dutch Flat Wildlife Area.

Turner Creek – Begin the survey at the upstream end of Upper Turner Meadow (also known as the Bushey Meadow) at the Forest Service boundary fence. The upstream end of the survey is located at Loveness Road (McKay Flat). If permission to survey the private land is granted, the downstream end of the survey will begin at the gabion fish barrier, which includes a portion of the Upper Turner Meadow.

Washington Creek – Begin the survey at the downstream end of the creek at the Forest Service boundary and proceed upstream to the 42N21 Bridge.

Coffee Mill Creek – Begin the survey directly upstream of the high gradient (waterfall) section at the mouth of the creek and proceed upstream to the fork in the SE ¼ of Section 22.

Hulbert Creek – Begin the survey at the downstream end at the Forest Service property boundary and proceed upstream to the private property boundary at Hulbert Flat.

Garden Gulch – Begin the survey at the downstream end at the Forest Service property boundary and proceed upstream through the rocky ravine continuing approximately another 300 meters. If permission to survey the private land is granted, the downstream end of the survey will begin at the confluence with Turner Creek.

Thomas Creek – Begin the survey at the downstream end at the Forest Service property boundary at Section 8 and proceed upstream to the private property boundary at Cox Flat. Within this reach, do not survey the private property within Sections 1 and 12.

Factors Indicating Potential Need for Action by the Service and its Partners

After each complete survey (conducted once every 2 years), the Service and its partners will compare the results with those from previous surveys and consider the implication of any observed reductions in abundance or threats to the species. If there has been only a relatively minor decrease in abundance or recruitment and if any increase in threats is likely to be temporary or readily resolved, the Service and its partners may determine that no additional response is necessary. For instance, natural environmental variation may cause variation in abundance over time (Freeman et al. 1988). However, if a more substantial change occurs, the Service and its partners may consider taking additional actions to avoid the need to relist the Modoc sucker. Examples of changes that may indicate additional actions should be considered include, but are not limited to:

1) A reduction of 25 percent or more in the number of occupied sites;

2) Surveys indicate that 50 percent or more of sites with high abundance change to a state of low abundance;

3) Analysis of data collected during surveys indicates threats (i.e., nonnative predatory fish and habitat degradation) have increased considerably over the PDM period; or

4) A catastrophic fire or flood event affects 25 percent or more of known occupied habitat.

In the event that changes like these occur, the Service and its partners may determine that the Service should take one or more of the actions listed below:

1) Hold a special meeting between the Service and its partners to discuss potential causes and severity of the observed change and appropriate responses;

2) Add new components to the PDMP;

3) Extend the PDM period;

4) Conduct a status review of the species, which would include a five-factor analysis of the threats to the species, to determine whether the species warrants relisting under the ESA; or

5) Emergency list the Modoc sucker.

Meetings and Reports

Every 2 years, the Service and its partners will convene to review the results of the most recent complete survey and discuss the state of the Modoc sucker, its habitat, and threats to the species. As part of these meetings, the Service will also consider changes to the PDMP; if changes are necessary, they will be implemented promptly, subject to available funding. An interim report will be written to document the survey results and meeting minutes.

Within 1 year of the end of the PDMP period, the Service will conduct a final internal review and prepare (or contract with an outside entity) a final report summarizing the results of monitoring. This report will include: 1) a summary of the results from the surveys of Modoc sucker occupancy, states of abundance, recruitment, and change in distribution; and 2) recommendations for any actions and plans for the future. The final report will include a discussion of whether monitoring should continue beyond the 10-year period for any reason. The Service may request species experts and other independent specialists to review drafts of the final report, as appropriate. The final report will be posted on the Service's website.

Funding

The PDMP will be implemented through cooperation between the Service, the Modoc National Forest, the Fremont-Winema National Forest, the CDFW and the ODFW. The estimated cost to conduct surveys in the survey streams listed above is $61,500 ($12,300 per year for 5 survey years) plus $14,400 ($2,880 per year for 5 survey years) for additional expenses. Thus, the estimated cost of each complete survey is $15,180 and total monitoring during the 10-year period is estimated at $75,900.

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