OWENS SUCKER
***Catostomus fumeiventris* (Miller)**

Status: Low Concern. While relatively secure, with a high degree of confidence about their status, the limited distribution of Owens sucker in a highly altered water system indicates a need to continue monitoring populations.

Description: Owens suckers are stout, with large heads, large mouths, long snouts and wide caudal peduncles. Their mouths are characterized by a deeply incised lower lip. Their scales are coarse and usually number less than 80 (66-85) along the lateral line. Rows of scales are 13-16 above and 9-11 below the lateral line. Ray fin counts are 16-19 for the pectoral, 10 for the dorsal, and 9-10 for the pelvic fins. Their coloration can be very dark but is normally slate on the dorsal surface and smoky on the belly, with blue iridescence on the sides. Spawning adults develop red coloration in a line along their sides and at the tips of the paired fins.

Taxonomic Relationships: The Owens sucker was first described as a population of sandbar suckers (*C. arenarius*; Snyder 1919), a species considered to be the same as the Tahoe sucker (*C. tahoensis*). However, they were recognized as a distinctive taxon by C. L. Hubbs in 1938 (Shapovalov 1941) and formally described as a species by R. R. Miller (1973). They are closely related to the Tahoe sucker (G. R. Smith 1992) and are able to hybridize with the Santa Ana sucker (*C. santaanae*; Hubbs et al. 1943, Crabtree and Buth 1981, Buth and Crabtree 1982).

Life History: Owens and Tahoe suckers share similar life history traits (R.R. Miller 1973, Moyle 2002). They feed largely at night, ingesting aquatic insects, algae, detritus and inorganic material from stream substrates. Spawning takes place in the spring and summer, from early May to early July. In Crowley Reservoir, Owens suckers spawn, sometimes in large numbers, along the shore in springs and gravel patches or in tributary streams (C.C. Swift, pers. comm. 1999). In May, 1975, large numbers (500-1000) of spawning adults were seen in a 200 m section of Hilton Creek, while smaller numbers were seen in the reservoir at 1-2 m depth. Larvae transform into juveniles at 19-22 mm TL, then move into margins or backwaters that are dominated by sedges (Miller 1973). Growth rates are not known but they rarely grow larger than 50 cm SL.

Owens suckers have the ability to sustain populations in altered environments, by quickly repopulating new habitats and withstanding the presence of nonnative fish species. In 2007, they were the first fish species to recolonize a 35 mile stretch of the lower Owens River upon rewatering of the stream channel (M. Hill, Ecosystem Sciences, pers. comm. 2009). Although the lower Owens River had gone dry due to water diversion, populations of Owens suckers were able to survive in small lakes and ponds and other off-channel habitats. These populations were able to disperse into new habitats once flows were reestablished. Once the only fish in Convict Lake, they are now found with alien trout species (Moyle 2002). They are also found together with brown trout (*Salmo trutta*) in pools in the Owens River Gorge (S. Parmenter, CDFW, pers. comm. 2009). However, trout maintain position in stream currents, while suckers are associated with the stream bottom. Likewise, they are found in the lower Owens River with

introduced bass (*Micropterus* spp.), but bass are generally found in slightly cooler and faster water than are suckers (M. Hill, pers. comm. 2009). Suckers in the lower river appear to withstand higher temperatures and lower dissolved oxygen concentrations than introduced bass (M. Hill, pers. comm. 2009).

Habitat Requirements: Owens suckers, in the Owens River and two of its tributaries, Hot Creek and Rock Creek, are most common in stream reaches with long runs and few riffles (Deinstadt et al. 1986). Habitat in these reaches is characterized by fine substrate with lesser amounts of gravel and cobble, water temperatures of 7-13°C, and pH of 7.9-8.0. In lakes and reservoirs, such as Convict Lake and Crowley Reservoir, adults are abundant near the bottom, regardless of depth. Adult suckers (> 15 cm) were also commonly found at the bottom of pools in a 10 mile reach of the Owens River Gorge (CDFW snorkel surveys 2008; S. Parmenter, CDFW, pers. comm. 2009). Recent surveys in the lower Owens River found suckers predominantly in off-channel habitats, such as backwaters (M. Hill, pers. comm. 2009).

Distribution: Owens suckers are an endemic species that are widely distributed in streams and rivers of the Owens River watershed, including the Owens River and Bishop Creek. They are most abundant in Crowley Reservoir (Mono County) and are also found in Convict Lake (Mono County) and Lake Sabrina (Inyo County). They were successfully introduced into June Lake (Mono Lake Basin), the Santa Clara River (Los Angeles County), and South Lake (Bishop Creek drainage) (Moyle 2002; S. Parmenter, CDFW, pers. comm. 2009). In the Santa Clara drainage, they are found in lower Sespe Creek, Piru Creek and Piru Reservoir ('Lake Piru'), and the outflow from Fillmore Trout Hatchery (Swift et al. 1993).

Trends in Abundance: Owens suckers are still abundant in most of their range, primarily due to their ability to adapt to life in Crowley Reservoir as well as the highly modified Owens River (Moyle 2002). Their populations in the river have increased as a result of restoration activities begun in the early 1990s (S. Parmenter, CDFW, pers. comm. 2009). In 1993, flows released from the Crowley Reservoir were increased as a result of a court decision in 1991. Improved flow management in the 'middle' Owens rewatered formerly dry reaches in the Owens River Gorge and allowed reestablishment of aquatic and riparian habitats, restoring ecosystem function to the benefit of fishes and other aquatic organisms (Hill and Platts 1998). In October, 2008, snorkel surveys of a 10 mile reach in the Owens Gorge found large numbers of Owens suckers and brown trout, often sharing the same habitats (S. Parmenter, CDFW, pers. comm. 2009). Owens suckers appear to be well established in the upper Owens River, as both juveniles and adults are commonly collected there (S. Parmenter, CDFW, pers. comm. 2009). They also appear to be well established in the lower Owens River (lower 60 miles), where they dominate species composition (M. Hill, pers. comm. 2009). Surveys in the lower river commonly find aggregations of more than 100 individuals (M. Hill, pers. comm. 2009).

Nature and Degree of Threats: Two factors may be limiting Owens sucker abundance in their range: 1) habitat degradation associated with dams and water diversions; and 2) invasive trout and bass species.

	Rating	Explanation
Major dams	Medium	Two large dams and aqueducts regulate flows in the Owens River
Agriculture	n/a	
Grazing	Low	Grazing is pervasive in the Owens River basin but few known effects on suckers
Rural residential	n/a	
Urbanization	Medium	The Owens River is a major source of water for expanding Los Angeles urban area; potential localized impacts from the town of Bishop
Instream mining	n/a	
Mining	n/a	
Transportation	n/a	
Logging	n/a	
Fire	Low	Present but with no know impacts on suckers
Estuary alteration	n/a	
Recreation	Low	Potential impacts from OHVs; effects likely minimal
Harvest	n/a	
Hatcheries	Low	Extirpated from a spring that feeds the Hot Creek Trout Hatchery
Alien species	Medium	Predation by alien species may limit abundance, but may be offset by differences in habitat utilization

Table 1. Major anthropogenic factors limiting, or potentially limiting, viability of populations of Owens sucker. Factors were rated on a five-level ordinal scale where a factor rated "critical" could push a species to extinction in 3 generations or 10 years, whichever is less; a factor rated "high" could push the species to extinction in 10 generations or 50 years whichever is less; a factor rated "medium" is unlikely to drive a species to extinction by itself but contributes to increased extinction risk; a factor rated "low" may reduce populations but extinction is unlikely as a result. A factor rated "n/a" has no known negative impact. Certainty of these judgments is moderate. See methods section for descriptions of the factors and explanation of the rating protocol.

Dams. The Owens River has been highly altered by dams and diversions, although it still supports large numbers of suckers, as does Crowley Reservoir. Owens suckers have benefited from rewatering of the upper and lower Owens River, but flows are still a fraction of what they once were. Sustained flows (40 cfs) in the lower River are approximately 5% of the river's natural capacity (S. Parmenter, CDFW, pers. comm. 2009). Groundwater extraction and surface diversion have lowered the water table and reduced water supply to riparian habitats in the Owens River Valley (Zektser et al. 2005). Given that so much of their habitat is in regulated waterways, there is an underlying threat to sucker populations through future changes in water management, especially during periods of drought.

Grazing. Livestock grazing is a pervasive land use in the Owens Valley and cattle can negatively affect riparian vegetation, stream channel morphology, stream bank stability, and water quality. However, federal agencies are establishing measures to

protect stream channels from grazing in this region (S. Parmenter, CDFW, pers. comm. 2009).

Urbanization. The growing demand for water by cities in the Los Angeles basin represents an increasing threat to the Owens River and its aquatic fauna, despite recent court decisions mandating that flows be maintained in the upper and lower parts of the river.

Recreation. Recreation is a major land use in the region, including use by off-road vehicles (OHVs). However, impacts on suckers appear to be minimal and federal agencies are developing measures to protect stream channels from OHVs (S. Parmenter, CDFW, pers. comm. 2009).

Fire. While wildfires are common in the region, they rarely affect sucker populations. Thus, populations have recovered quickly after repeated wildfires in the Rock Creek drainage (S. Parmenter, CDFW, pers. comm. 2009)

Hatcheries. Pest removal practices used by the Hot Creek Trout Hatchery appear to have extirpated Owens sucker from the spring which feeds the hatchery (S. Parmenter, CDFW, pers. comm. 2009). However, this is a very small part of the historic range of the Owens sucker and hatchery impacts to Owens sucker have otherwise been minimal.

Alien species. Alien species may represent a threat to Owens sucker; however, Owens sucker populations appear to have maintained in their presence. Brown trout are common in the Owens River Gorge (Hill and Platts 1998; S. Parmenter, CDFW, pers. comm. 2009) and may prey on young suckers. Bass, common carp (*Cyprinus carpio*), and catfish (species unknown) are common in the lower Owens River (M. Hill, pers. comm. 2009; S. Parmenter, CDFW, pers. comm. 2009). Owens sucker abundance does not appear to have been limited by their interactions with these species and they presumably persist through a combination of large size, high fecundity, and distinctive life history. Suckers appear to outgrow predation pressure by the time they become adults and/or by using different habitats than alien species.

Effects of Climate Change: The most noticeable and widespread impacts of climate change on aquatic habitats in California will be continued increases in water temperatures and changes to the frequency and timing of both drought and flooding events. Air temperatures (both winter and summer) are expected to increase somewhere between 1°C and 6°C by 2100, with a similar increase in water temperatures in summer, along with decreased summer flows because of reduced snowpack (Cayan 2009, Moyle et al. 2013). Although the environmental tolerance of Owens sucker has not been studied, they appear to withstand temperatures in excess of 22°C (M. Hill, pers. comm. 2009), similar to the tolerances of Tahoe sucker, their closest relative (Moyle 2002). Climate change is not expected to increase water temperatures beyond the thermal limits of native fishes in the Owens River Valley (Parmenter 2008). However, high stream temperatures may reduce individual fitness by increasing physiological maintenance costs (Moyle and Cech 2004) and changes to hydrographs may change the spawning ecology of fishes (Parmenter 2008).

Elevated air temperatures associated with climate change will change the periodicity and magnitude of peak and base flows in streams due to a reduction in snow pack levels and seasonal retention. Streams in the Owens River basin may be not as heavily impacted as those in northern California due to the higher elevations (> 3000 m)

of the southern Sierra Nevada (Hayhoe et al. 2004). Nevertheless, predictions are that stream flow will increase in the winter and early spring and decrease in the late summer and fall (Knox and Scheuring 1991, Field et al. 1999, CDWR 2006). It is worth noting that Owens suckers are found in streams that are regulated by dams and diversions, so flows could be manipulated to favor them; however, severe drought could increase water demands in southern California urban areas that might override any flow protections for fishes in the Owens Valley. As such, Moyle et al. (2013) scored the Owens sucker as "highly vulnerable" to climate change.

Status Determination Score = 4.0 – Low Concern (see Methods section Table 2). The California Natural Diversity Database and NatureServe consider the Owens sucker as G3S3, a species that has only a moderate risk of extinction. There does not appear to be any threat to the extinction of Owens sucker at the present time; however, it has been included in the last two iterations of this report with lower ratings of status, but increasing information certainty suggests higher (less vulnerable to extinction) status.

Metric	Score	Justification
Area occupied	1	Native to only one watershed, although introduced into two others
Estimated adult abundance	5	Adults are common throughout most of their range
Intervention dependence	5	None required
Tolerance	5	Owens sucker withstand high temperatures and low dissolved oxygen levels
Genetic risk	4	Possible threat from introductions of other sucker species
Climate change	4	Should persist through most foreseeable changes, unless water diversions greatly increase
Anthropogenic threats	4	See Table 1
Average	4.0	28/7
Certainty (1-4)	3	

Table 2. Metrics for determining the status of Owens sucker, where 1 is a major negative factor contributing to status, 5 is a factor with no or positive effects on status, and 2-4 are intermediate values. See methods section for further explanation.

Management Recommendations:

Habitat restoration. Futher habitat restoration should be pursued in the Owens Valley to support Owens suckers and other native fishes, adding to ongoing efforts. Although the Owens River has been significantly altered by dams and water diversions, reestablished flows in the middle and lower portions of the river are naturally restoring ecosystem function. After five years of a managed flow regime, the Owens River Gorge was able to sustain a productive riparian system (measured by density of riparian vegetation and number of brown trout) (Hill and Platts 1998). Efforts are underway to curtail impacts from OHVs and grazing on aquatic habitats in the upper Owens River. A habitat conservation plan is currently being drafted, in part, for the recovery of native fishes in the lower river (M. Hill, pers. comm. 2008). This plan should be fully

implemented in order to maintain and, where feasible, improve ecosystem function and provide for additional habitats for native fishes.

Alien species. Owens sucker appear to withstand interactions with alien species. However, studies have not been completed to test whether predation and/or competition are impacting the survival and fitness of Owens sucker populations. A general policy in the Owens Valley should be to prevent the introduction of additional species and to reduce the populations of established alien species.

Refuges. Although they have not yet been introduced into the Owens Valley Native Fish Sanctuary, located north of Bishop, due to their abundance and widespread distribution in the Owens River watershed, the option of introducing Owens suckers into this refuge (and other refuges) should be evaluated.

Monitoring. In general, Owens sucker populations appear to be stable. However, populations should be closely monitored because they have a limited geographical range and most of their populations are found in habitats that are dominated by introduced fishes, which may displace them from optimal habitats (Moyle 2002, Parmenter 2008).

Research. Studies should be initiated to determine the environmental tolerances of Owens suckers in order to better understand how their populations may respond to predicted changes in environmental conditions.

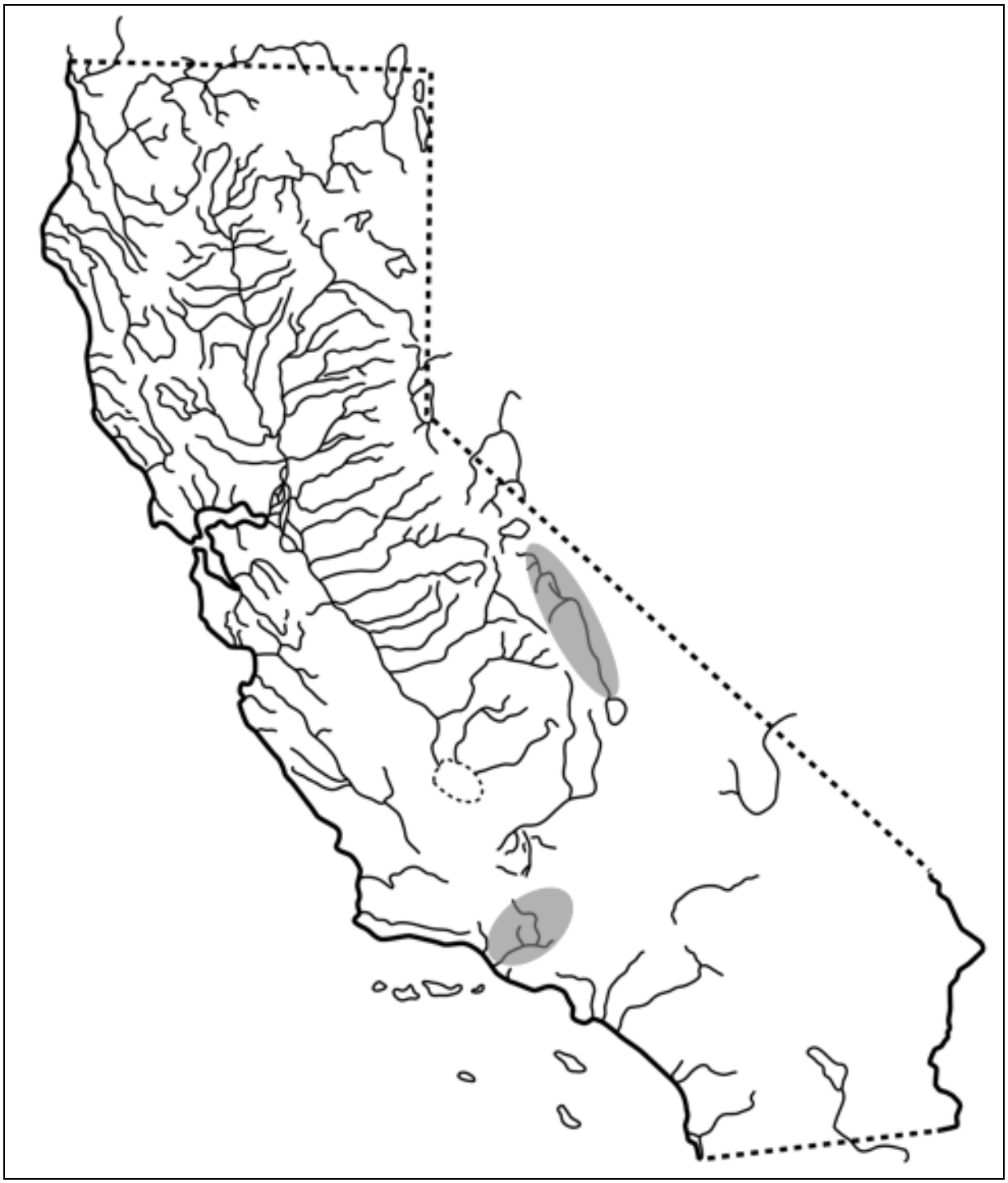

Figure 1. Distribution of Owens sucker, *Catostomus fumeiventris*, in California. The southern coastal population is introduced.