Willamette River Oregon Chub

Interim Risk Assessment

Oregon chub *(Oregonichthys crameri*), small minnows endemic to the Willamette Valley, were federally listed as endangered under the Endangered Species Act in 1993. Factors implicated in their decline included loss of habitat and predation and competition by non-native fish species (USFWS 1998). Historically, this species was widely distributed throughout the Willamette Valley (Markle et al. 1991). Oregon chub prefer off-channel habitats with minimal or no flow, an abundance of vegetation, and depositional substrate including sloughs, backwater pools, stable beaver ponds, oxbows, and low gradient tributaries (Pearsons 1989; Scheerer and McDonald 2003).

The status of the Willamette River Oregon Chub SMU was assessed by compiling the results of assessments of each constituent population. For each interim criterion, the designation of "pass" or "fail" for the SMU was dependant on the percentage of populations passing a particular criterion. The SMU passed each criterion if 80% of the constituent populations passed that particular criterion. If a pass/fail designation could not be made at the population level, then those populations were not incorporated into the SMU level assessment. The Willamette River Oregon chub SMU is classified as "at risk" because three of the six interim criteria were met.

Existing Populations

The Willamette River Oregon chub SMU is comprised of 15 populations that were once a large metapopulation. Currently eight populations exist. One large population dominates the SMU (Middle Fork Willamette River). Six smaller populations exist in the North Santiam River, South Santiam River, Mid Willamette River, McKenzie River, Marys River, and Coast Fork Willamette River (Scheerer et al. 2004). Populations were identified based on ODFW investigations (Scheerer 2002) (Table 246). Populations consist of several locations supporting chub within the major Willamette River subbasins. Most locations containing Oregon chub are currently isolated from others that comprise the local population. Current flow management in the Willamette basin restricts movements between populations.

Table 238. Description of the Willamette River Oregon Chub SMU populations.

Exist	Population	Description
No	Lower Willamette	Lower mainstem and Willamette tributaries.
No	Tualatin	Tualatin River and tributaries.
No	Clackamas	Clackamas River and tributaries.
No	Yamhill	Yamhill River and tributaries.
No	Molalla	Molalla River and tributaries.
No	Luckiamute	Luckiamute River and tributaries.
Yes	North Santiam	North Santiam River and tributaries.
Yes	South Santiam	South Santiam River and tributaries.
Yes	Mid Willamette	Middle mainstem Willamette River and tributaries.
Yes	Marys River	Marys River and tributaries.
No	Calapooia	Calapooia River and tributaries.
Yes	Long Tom	Long Tom River and tributaries.
Yes	McKenzie	McKenzie River and tributaries.
Yes	Coast Fork	Coast Fork Willamette River and tributaries.
Yes	Middle Fork	Middle Fork Willamette River and tributaries.

Distribution

In the past 150 years, the channel length and complexity of the Willamette River has been drastically reduced by the construction of 13 major flood control dams, large scale removal of snags for navigation, channelization and revetments, and the drainage of wetlands to increase the land available for river bottomland agriculture (Sedell and Froggatt 1984; Benner and Sedell 1997). Floods in the winter and spring months were common prior to the construction of the dams (1941-1969), averaging 14 floods above bankfull per decade from about 1884 through 1969 (Corps of Engineers 1970). A 10-year flood event prior to construction of the dams now has a 100-year return interval (Benner and Sedell 1997). Channelization and the construction of flood control dams restricts or eliminates many of the linkages and interactions between the river and its floodplain (Gabriel 1993) and have been detrimental to native fish that rely on floodplain habitats (Bayley 1991; Osmundson and Burnham 1998; Modde et al. 2001).

Distribution of Oregon chub has been assessed through regional surveys conducted annually by ODFW since 1991 and by Oregon State University in 1987 (Pearsons 1989). New locations containing Oregon chub have been discovered from extensive surveys conducted at 650 locations distributed throughout the Willamette River drainage. These findings, combined with successful reintroductions of Oregon chub at ten locations within their historic range, represent the current known distribution of Oregon chub. Current distribution includes habitats in the North Santiam, South Santiam, Mid Willamette, McKenzie, Coast Fork Willamette, and Middle Fork Willamette rivers (Scheerer et al. 2004). All populations occupy less than 50% of the population's historic habitat.

Historic distribution data are not complete. Most historic occurrence data was collected incidental to sampling for other purposes. Historic records exist for Oregon chub in the Clackamas, Lower Willamette, Molalla, Luckiamute, North and South Santiam, Mid Willamette, Marys River, Calapooia, Long Tom, McKenzie, Coast Fork Willamette, and Middle Fork Willamette River drainages (n=29 records total). Oregon chub are presumed to have been present historically in the Tualatin and Yamhill drainages. Oregon chub currently exist at eight of the 29 historic locations (28%). ODFW defined the "presumed" historic range using a combination of historic records for Oregon chub, current and historic distributions of co-occurring fish species (threespine stickleback, redside shiner, etc.), and a GIS digital elevation model. Based on the distribution of co-occurring fish species, historical Oregon chub records, and the current Oregon chub distribution, ODFW assumed that historical distribution encompassed mainstem rivers and tributary streams in the Willamette basin below 500 meters in elevation. Using a GIS digital elevation model and historical stream data layers, we calculated the historical stream area for Oregon chub and compared this with the area of habitats comprising the current Oregon chub distribution. We found Oregon chub are currently present in less than 1 percent of their historic habitat in the SMU (populations ranged from 0-1.9%). In addition, ODFW has conducted extensive sampling since 1991. In 2004, Oregon chub were present at only 32 locations (4.9% of the 650 locations sampled). Habitats sampled were all considered suitable Oregon chub habitats. All populations failed the distribution criterion, as written in the Native Fish Conservation Policy interim criteria.

Abundance

Data describing the abundance of constituent populations of the Willamette River SMU over the last 30 years are not available. The number of populations (subbasins) with at least one location

that supports 500 or more adult Oregon chub, and has shown a stable or increasing abundance trend for the past five years, was used as a surrogate. Our assumption is that historically, at least one location, supporting a stable population of at least 500 chub, existed in each population.

The Oregon Chub Recovery Plan (USFWS 1998a) sets recovery criteria for downlisting and delisting. To downlist the species from endangered to threatened, the plan requires the management of ten locations supporting at least 500 adult chub. The fish abundance at these locations must show a stable or increasing trend for five years. At least three of these locations must exist in each of the following subbasins: Santiam River (includes North Santiam and South Santiam populations), Middle Fork Willamette River, and mainstem Willamette and tributaries (includes McKenzie, Mid Willamette, Long Tom, Marys River, Calapooia, Luckiamute, Lower Willamette, Molalla, Yamhill, Tualatin, and Clackamas River populations). To delist the species there must be 20 locations supporting at least 500 adult chub. The fish abundance at these locations must show a stable or increasing trend for seven years. At least four of these locations must exist in each of the previously listed subbasins.

In 2004, four Oregon chub populations had at least one location that supported 500 or more adult chub and showed a stable or increasing abundance trend for five years (Scheerer et al. 2004). These four populations passed the abundance criterion (Table 239). Another population (McKenzie River) had at least one location that supported 500 or more adult Oregon chub in 2004, but lacked the five years of data required to adequately assess abundance trends.

Table 239. Populations of Oregon chub that pass or fail the abundance criterion.

Population	No. of Locations Passing the Criterion[a]	Pass/Fail
Lower Willamette River	0	Fail
Tualatin	0	Fail
Clackamas	0	Fail
Yamhill	0	Fail
Molalla	0	Fail
Luckiamute	0	Fail
North Santiam	1	Pass
South Santiam	1	Pass
Mid Willamette	0	Fail
Marys River	2	Pass
Calapooia	0	Fail
Long Tom	0	Fail
McKenzie	0	Fail
Coast Fork	0	Fail
Middle Fork	8	Pass

[a] *The number of locations per population that contain 500 or more adult chub and have exhibited a stable or increasing trend for at least five years.*

Productivity

No data are available to assess productivity and the rate of population growth at the population level. Although population estimates have been obtained at all chub locations since 1996, abundance estimates do not include age-0 fish. Limited aging data are available from three locations in the Middle Fork Willamette population. These data suggest that productivity may be adequate to maintain population abundance at these locations (Scheerer and McDonald 2003).

Limited information that relates to Oregon chub productivity comes from the monitoring of chub reintroductions. ODFW has conducted several introductions of Oregon chub into habitats in the Middle Fork Willamette, Mid Willamette, Santiam, McKenzie, and Coast Fork Willamette

drainages. A comparison of the most recent population estimate with the number stocked suggests that productivity is generally adequate to maintain chub abundance at these locations (Table 240). However, it should be noted that these introductions occurred at sites that contained only native fishes or no fish.

Table 240. Summary of Oregon chub introductions (from Scheerer et al. 2004).

Population	Site	# Stocked	Year	2004 Abundance
Santiam	1	500	1999-2003	570
Mid Willamette	1	573	1997-1998	25,810
	2	154	1998-2001	70
	3	50	2002	220
McKenzie	1	500	2001-2002	720
Coast Fork Willamette	1	400	2002	350
Middle Fork Willamette	1	500	1996	5,850
	2	50	1998	4,780
	3	576	1994	0[a]
	4	525	1994	0[a]

[a] *Non-native fish invaded or were illegally stocked at these locations*

Chub productivity is compromised by the presence of non-native fish. Oregon chub abundance at locations containing non-native fishes is low and/or declining. In some cases, chub have been extirpated after non-native fish have colonized the site (Scheerer 2002). Non-native fish have also been collected from historical sites (Oregon State University Museum records) that once contained Oregon chub in the Lower Willamette, Molalla, South Santiam, Mid Willamette, Calapooia, Long Tom, Coast Fork Willamette, and Middle Fork Willamette River basins.

Introduction of non-native fishes in Willamette River began in the late 1800s (Dimick and Merryfield 1945; Lampman 1946; McIntosh et al. 1989). Non-native centrarchids and *Ameiurus* spp., have been widely implicated in the decline of native fish (Lemly 1985; Moyle 1976; Newman 1993; Rinne and Minckley 1991; Simon and Markle 1999), are common in the Willamette River basin, and are considered to be the greatest current threat to the recovery of Oregon chub recovery (USFWS 1998, Scheerer 2002).

Non-native fish are common in suitable Oregon chub habitats. The impacts of non-native fish were considered minor if 28% (or less) of the suitable habitats sampled contained non-native fish. We chose 28% as the benchmark because this is the percentage of sites where we collected non-native fish in the Middle Fork Willamette River subbasin, which contains the largest concentration of locations supporting large numbers of Oregon chub. ODFW sampled 650 suitable Oregon chub habitats in the Willamette River basin between 1991 and 2004. This criterion was not assessed for any population where fewer than 20 locations were sampled (Tualatin, Clackamas, Yamhill, Molalla, and Luckiamute populations). Three of the populations that were assessed met this criterion (Middle Fork Willamette, Marys, and McKenzie populations)

Reproductive Independence

All Oregon chub are naturally-produced. No hatchery programs exist. All populations passed this criterion.

Hybridization and other negative impacts of nonnative fishes

Interspecific hybridization has not been identified as an issue for Oregon chub. All populations passed this criterion.

Table 241. Presence of non-native fish in Oregon chub habitats.

Population	No. of Sites Sampled	Sites with Non-native Fish (%)	Pass/Fail
Lower Willamette	68	53	Fail
Tualatin[a]	<20	--	--
Clackamas[a]	<20	--	--
Yamhill[a]	<20	--	--
Molalla[a]	<20	--	--
Luckiamute[a]	<20	--	--
North Santiam	62	40	Fail
South Santiam	43	42	Fail
Mid Willamette	73	52	Fail
Marys	40	28	Pass
Calapooia	22	55	Fail
Long Tom	25	84	Fail
McKenzie	54	22	Pass
Coast Fork Willamette	84	55	Fail
Middle Fork Willamette	125	28	Pass

[a] *This criterion was not assessed for these populations.*

Conservation Measures

In 1991, the Oregon Chub Working Group, a group of federal and state agency biologists, academics, and land managers was formed. The group, including representatives from the U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Army Corps of Engineers, Bureau of Land Management, Oregon Department of Fish and Wildlife, Oregon Parks and Recreation Department, Oregon Department of Transportation, and Oregon State University, has been active in conserving and restoring habitat for the Oregon chub and raising public awareness of the species since before the federal listing in 1993.

In 1992, an interagency "Conservation Agreement for the Oregon Chub in the Willamette Valley, Oregon" was completed and signed by the U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Army Corps of Engineers, Bureau of Land Management, Oregon Department of Fish and Wildlife, and Oregon Parks and Recreation Department. The purpose of the coordinated plan was to facilitate Oregon chub protection and recovery and to serve as a guide for all agencies to follow as they conduct their missions. The goal of the plan was to reverse the declining trend of Oregon chub populations, and to increase the abundance of this species in healthy, wild populations through protection of habitat, reintroductions to suitable habitat within its historic range, and public education and involvement.

In 1993, a "Risk Assessment Analysis for Oregon Chub" was drafted by the Oregon Department of Fish and Wildlife. The purpose of the document was to provide guidelines for the founding of new populations of Oregon chub. The document sets guidelines for numbers of fish to be stocked, genetic considerations in choosing donor populations, timing of introductions, and the monitoring protocol to determine the progress and success of introductions.

In 1996, the U.S. Fish and Wildlife Service prepared and signed, in coordination with the U.S. Forest Service, Bureau of Land Management, and U.S. Army Corps of Engineers, a programmatic environmental assessment for the establishment of Oregon chub populations within the Willamette River basin. This document streamlines the process of reintroducing the species into suitable habitats within its historic range.

In 1996, a no-spray agreement with the Oregon Department of Transportation was formalized to protect Oregon chub sites located in the Middle Fork Willamette River drainage adjacent to

Highway 58. The agreement prohibits spraying of herbicides in the vicinity of Oregon chub sites and limits vegetation control to mechanical methods, if necessary.

In 1997, a Memorandum of Understanding (MOU) was signed by the U.S. Fish and Wildlife Service and the City of Salem to protect Oregon chub at the Geren Island Water Treatment Facility in the North Santiam River. The MOU sets interim restrictions on facility operations that might affect Oregon chub on the site until a formal Habitat Conservation Plan (HCP) is developed. Also in 1997, a draft HCP was prepared by consultants for the City of Salem to protect and enhance the populations of Oregon chub located at Geren Island. The HCP covers normal operations as well as the proposed expansion of the facility, and will provide protected habitat for Oregon chub for the life of the facility.

Section 7 consultation by U.S. Fish and Wildlife Service on actions authorized, funded, or carried out by federal agencies has occurred on numerous occasions since the 1993 listing. The purpose of the consultations was to determine potential impacts of various actions on Oregon chub and to reduce or eliminate the impacts. Actions include, but are not limited to, natural gas pipeline expansion, gravel mining operations, installation of screens on an irrigation canal, application of biosolids in the floodplain, and operation of Willamette Basin hydropower dams.

Additional conservation measures that were implemented to improve the status of Oregon chub include reintroductions into suitable habitats within their historic range, habitat enhancement projects, and public education.