3.6 Summary of Current Status and Health of Oregon's Freshwater Fish Communities

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Report Card

- 45% of Oregon's freshwater fish have declined and are at risk of extinction. (Oregon is ranked fifth among the states in terms of the greatest number of listed fish species.)
- Approximately 60% of native fish in the lower Willamette exhibit external abnormalities.
- Localized (endemic) populations of suckers and chubs in southern Oregon are fragmented and many have declined in recent years.
- More than 32 species of freshwater fish have been introduced into Oregon and are now self-sustaining, making up approximately one-third of Oregon's freshwater fish fauna.

Key Indicator

1. Proportion of the percentage of wild, native fish populations, including salmon, that are classified as healthy.

Introduction

Fish have played a central role in the history and economy of Oregon. Many have said that the Pacific Northwest is defined as "anywhere the salmon go". Our regional identity is closely tied to salmon, which link the land, rivers, and Pacific Ocean. Fish serve as indicators of healthy, functioning ecosystems, economically healthy resource-based industries, cultural values of Native Americans and recent Oregonians, recreation opportunities, and the livability of our communities. The importance of fish and the fundamental need to protect this resource are rarely questioned by the public.

Definitions of healthy fish communities

The health of Oregon's fish communities can be described from all three perspectives of health developed in this report: naturally functioning systems, sustainable productivity, and compliance with laws and policies. A fundamental definition of a healthy fish resource is naturally functioning populations that can maintain their abundance, composition, distribution across the landscape, and ecological functions in the face of unpredictable disturbances and environmental change without continued human intervention. From an ecological perspective, healthy fish populations maintain their abundance despite environmental change and episodic disturbances. The geographic range of healthy species does not shrink. Healthy fish communities are composed primarily of native species, and species introduced from other regions are not dominant. Lesions, tumors, and deformities are rare. Healthy fish populations provide critical ecosystem functions, such as structuring food webs through predation and competition and supplying nutrients from other ecosystems. Migratory species, such as salmon and steelhead, transport important nutrients from marine ecosystems to both freshwater and adjacent terrestrial ecosystems. Fish populations often reflect the effects of many land uses, pollutants, habitat conditions, and thus serve as valuable indicators of environmental conditions.

Considering the second perspective of health, the sustainability of resource uses, healthy fish resources are self-sustaining populations that are sufficiently abundant and well distributed to meet cultural values and economic needs. Fish are an important component of Oregon's economy, supporting commercial fishing, coastal charter sport fishing, fishing in inland streams and lakes, sporting goods, and resorts. Healthy fish stocks are able to support some level of harvest and still maintain self-sustaining populations.

Fish represent a difficult challenge for resource management and community-based decisions about resource use. Land uses or environmental degradation in one portion of the state can cause declines in migratory fish and result in economic impacts on communities far from the cause of the decline. Local community decision-making processes cannot effectively influence the decisions that lead to the resource impacts. Thus, regional conservation strategies are essential frameworks for managing fish resources.

Ecosystem health from the perspective of meeting legal standards applies to fish resources because they are protected under numerous federal and state laws. These regulations are designed to protect fish populations as both ecosystem components and resource commodities. Commercial and sport fishing are protected by state regulations and regional commissions. State laws are designed to protect Oregon's biological diversity. Regardless of debates about their effectiveness, these regulations can be used as measures of fish resource health in terms of numbers of protected species, level of allowed harvest, and legislated protection.

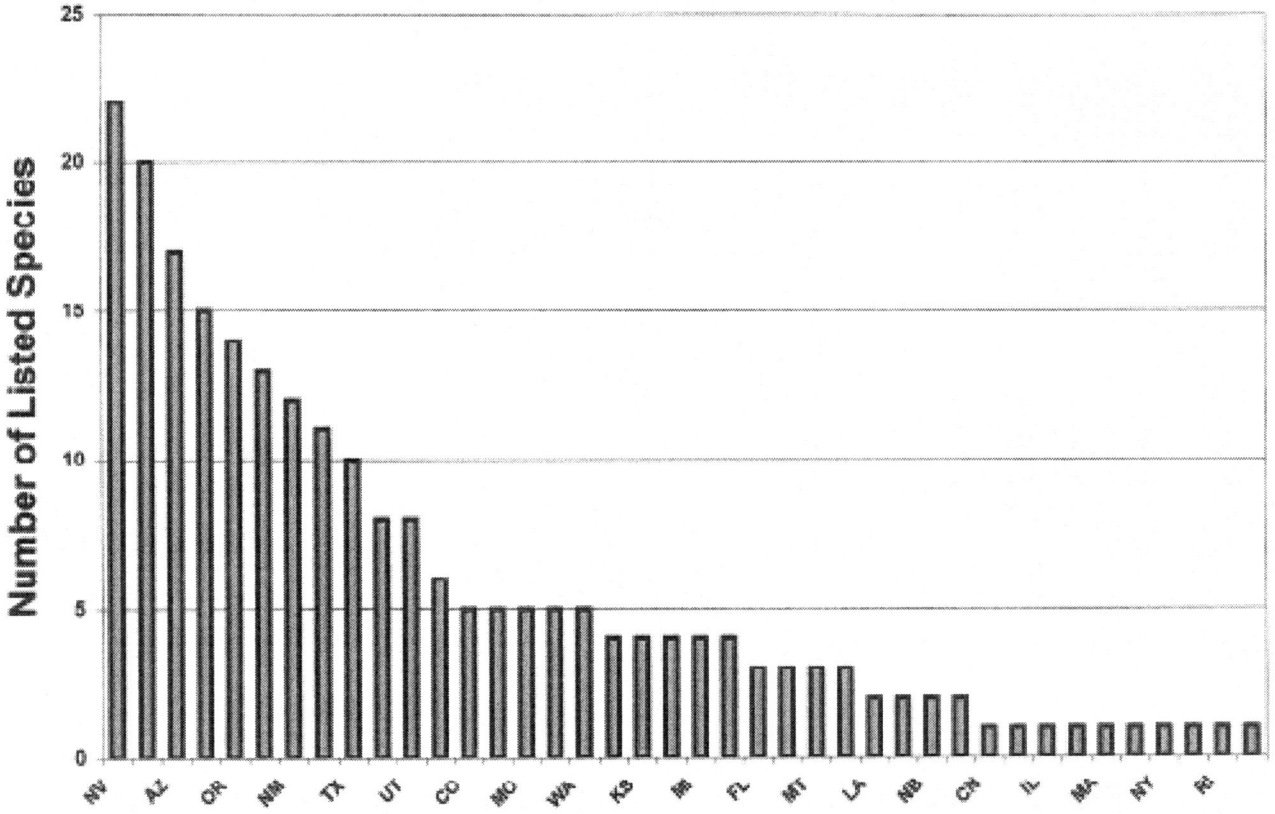
Indicators

One of the most important indicators of the health of fish in Oregon is the proportion of salmon and other fish populations that are classified as healthy in each ecoregion. A direct measure of the health of fish species is its abundance and geographic distribution. Statewide assessments for all fish species are not available because of the extraordinary effort required to measure abundance or distribution. Oregon Department of Fish and Wildlife is renewing its recurring assessment of Health of Native Fish Populations in Oregon. This assessment could be revised to 1) be spatially explicit, 2) incorporate distributions of fish species throughout each ecoregion, and 3) incorporate existing data on population trends and formal considerations for listing. This approach would require development of a scientifically sound measure of the presence and absence of fish species throughout each ecoregion. The indicator would be the proportion of the populations or stocks that are healthy (not declining or at risk), and the state would expect the proportion of healthy populations to be maintained or increased in the future.

This indicator and measurement approach would provide several additional pieces of information. Examples would include proportions of exotic fish species, proportions of fish that are diseased or deformed, presence of species at risk, and relative abundances of salmonids.

The level of harvest allowed for both commercial and sport fishing is one measure of sustainable production of resources.

Figure 3.6-1. Number of fish species federally listed as threatened or endangered as of May 2000



Source: U.S. Fish & Wildlife Service website of current listed species: http://www.endangeredspecie.com

Fishing limits are socially meaningful because they are a direct measure of the stocks that Oregonians consider to be healthy. Harvest limits are insensitive to short-term changes in abundance because they also are determined by economic, political, and social objectives. Historically, harvest levels rarely have been adjusted until major declines in fish populations are detected.

A major legal indicator of the status of fish populations in Oregon—extinctions and threatened or endangered listings—provides an extreme but meaningful measure of Oregon's environment. Unfortunately, this indicator of fish health rarely serves as an early warning system, but rather indicates the need for extremely protective measures to prevent complete loss of species or stocks.

Current conditions and trends

Sixty-three species or recognized subspecies of native freshwater fish are found in Oregon. Currently, 14 of those species or subspecies are listed under the Endangered Species Act as threatened or endangered (ODFW 1995). An additional 15 species are listed as candidate species and their status is being evaluated (**Table 3.6-1**). This means that 45% of Oregon's freshwater fish are at risk of extinction or have declined to levels that warrant state or federal efforts to protect them. Oregon ranks fifth in terms of the greatest number of listed fish species in a comparison of fish species that are federally listed as threatened or endangered throughout the United States (**Figure 3.6-1**).

Five of the species that are listed are salmon or trout, and they include 22 genetically distinct populations or stocks that are listed as threatened, endangered or candidates for listing. A review of salmon stocks throughout the Pacific Northwest indicated that 214 stocks face significant risk of extinction (Nehlsen et al., 1991). Since that review, none of the stocks at risk have been shifted to a more stable category, but 12 additional stocks of salmon have been federally listed as threatened or endangered. Numbers of anadromous fish migrating over falls or barriers, such as Willamette Falls, Winchester Dam, Bonneville Dam and others, have declined sharply over the last several decades. In response to concerns about the health of these salmon populations, commercial and sport harvest have been sharply curtailed and fishing for coastal coho salmon was eliminated entirely from 1994 to 1998.

Table 3-6-1. Native species of Oregon freshwater fish and their status under federal and state legislation.

Species	Federal status	State status
Green sturgeon		
White sturgeon		
Chiselmouth		
Bridgelip sucker		
Largescale sucker		
Sacramento sucker		
Sacramento sucker sp	Candidate	Sensitive—critical
Mountain sucker		
Klamath smallscale sucker	Candidate	
Jenny Creek sucker	Candidate	Sensitive—naturally rare
Klamath largescale sucker		
Tahoe sucker		Sensitive—peripheral
Warner sucker	Threatened	Threatened
Shortnose sucker		
Coastrange sculpin		
Prickly sculpin		
Mottled sculpin		
Malhuer mottled sculpin	Candidate	Sensitive—critical
Piute sculpin		
Shorthead sculpin		
Riffle sculpin		
Marbled sculpin		
Margined sculpin	Candidate	Sensitive—vulnerable
Reticulate sculpin		
Pit sculpin	Candidate	Sensitive—peripheral
Klamath Lake sculpin		
Torrent sculpin		
Slender sculpin	Candidate	

Table 3-6-1. Native species of Oregon freshwater fish and their status under federal and state legislation (continued).

Species	Federal status	State status
Shiner perch		
Lost River sucker	Endangered	Endangered
Three-spined stickleback		
Alvord chub	Candidate	Sensitive—vulnerable
Tui chub		
Catlow tui chub	Candidate	Sensitive—vulnerable
Goose Lake tui chub		Sensitive—critical
Hutton Springs tui chub	Threatened	Threatened
Oregon lakes tui chub	Candidate	Sensitive—vulnerable
Sheldon tui chub	Candidate	Sensitive—critical
Summer Basin tui chub	Candidate	Sensitive—critical
Warner Basin tui chub		Sensitive—critical
Borax Lake chub	Endangered	Endangered
Blue chub		
California roach	Candidate	Sensitive—peripheral
River lamprey		
Pit-Klamath brook lamprey		
Miller Lake lamprey		
Western brook lamprey		
Lampetra similis		
Pacific lamprey		Sensitive—vulnerable
Goose lake Pacific lamprey		Sensitive—critical
Burbot		
Peamouth		
Lahonton cutthroat trout	Threatened	Threatened
Pink salmon	Endangered	Endangered
Chum salmon	Threatened	
Coho salmon	Threatened	Endangered
Rainbow trout		
Steelhead	Threatened	Sensitive—critical
Redband trout	Petitioned	
Sockeye salmon		
Chinook salmon	Threatened	Threatened
Oregon chub	Endangered	Endangered
Umpqua chub	Candidate	Sensitive—vulnerable
Sand roller		
Starry flounder		
Mountain whitefish		
Northern pikeminnow		
Umpqua pikeminnow		
Longnose dace		
Millacoma dace		Sensitive—naturally rare
Umpqua dace		
Leopard dace		
Speckled dace		
Foskett speckled dace	Threatened	Threatened
Redside shiner		
Umpqua redside shiner		Sensitive—peripheral
Lahonton redside shiner		
Bull trout	Threatened/Endangered	Sensitive
Eulachon		

Though not as highly publicized as anadromous salmon, localized (endemic) populations of suckers and chubs in southern Oregon are fragmented and many have declined in recent years. Such populations are inherently vulnerable because of their isolated and patchy distributions. Combined effects of water withdrawal and drought conditions over the last decade have caused several populations to decrease and raise concerns over their survival.

Occurrence of tumors, lesions, and deformities in fish is a direct measure of fish health that is closely related to human health and environmental contamination. Major concerns have been raised about the high proportion of open lesions, tumors, and skeletal deformities in largescale sucker and northern pike minnow in the lower Willamette River near Portland. Skeletal deformities comprised less than 5% of the fish sampled upstream of Corvallis, increased to 20% between Corvallis and Newberg, and exhibited the highest incidence (56%) in the Newberg Pool (Ellis et al., 1997). Studies by Oregon State University researchers in 1998 found that less than 20% of the fish in the upper Willamette River exhibited some form of external abnormality in contrast to 60% of the fish with external abnormalities in the lower Willamette.

Another indicator of stress on native fish communities is the proportion of fish species introduced from other regions. More than 32 species of freshwater fish have been introduced into Oregon and are now self-sustaining, making up approximately one-third of Oregon's freshwater fish fauna. Most of these introductions have been intentional, primarily for sport fishing. Others, like grass carp and mosquito fish, were introduced for biological control. Introduced species are predators on native species, compete for food resources, and alter freshwater habitats. In 1998, researchers at OSU found that introduced fish comprised less than 5% of the number of species found in the upper Willamette River near the McKenzie River but accounted for more than 60% of the observed species in the lower river near Portland. Introductions of predators, such as bass and other sunfishes, have been identified as one of the major causes for the decline of Oregon chub in the Willamette River and Umpqua chub in the Umpqua River.

Causes of trends

Identification of the causes for declines of fish populations has been one of the most divisive debates in the Pacific Northwest in the latter half of the twentieth century. Relative impacts of different factors, both human action and natural environment, differ by species, historical period, and geographic location. Freshwater and estuarine habitats have been affected by timber harvest, livestock grazing, agriculture, water withdrawal, urbanization, and mining. Commercial fishing and sport fishing have caused major declines. Hydroelectric development has altered freshwater habitat and created sequences of barriers for both young and adult migrating fish. Hatchery operations have altered the genetic composition of salmonid stocks and changed the timing of their migrations. Use of hatcheries when wild fish numbers are low encourages continued impacts on the declining populations and can be extremely detrimental. Predation by marine mammals, birds, and introduced fish species can be locally intense pressures on declining populations, and the impact of predation is exacerbated by habitat simplification that make such predators more effective. Natural shifts in climate, such as recent warming trends related to El Niño events, have stressed populations and amplified the detrimental effects of human impacts.

Threats

The severity and magnitude of many of these human sources of degradation and stress were largely uncontrolled in the late 1800s and early 1900s. Though many regulations now attempt to protect fish, freshwater habitats continue to be affected by logging, livestock grazing, water withdrawal, agriculture, mining, and urbanization. One of the major challenges to reversing trends in habitat degradation is the unevenness of land use laws and regulations. Riparian practices on both public and private forest lands are controlled to a much greater degree than on range, agricultural, or urban lands. Ecological and environmental protections asked of forest land managers are not asked of agricultural and urban land owners. Management practices in riparian and stream habitats on agricultural lands and urban areas in the future are highly uncertain. One major difference between agricultural and urban lands is that most agricultural practices are reversible in the future, but many changes in urban and residential areas are much less reversible.

Consequences of water quality for fish communities will continue to be a major concern, particularly with respect to water temperature and toxic contaminants. Lack of riparian protection on urban, agricultural, and range lands will continue to raise questions about attainable stream temperatures, particularly in lowland streams and large rivers. The numbers of streams that fail to meet water quality standards are likely to increase as better data become available through improved water quality monitoring. Many of the extreme water pollution sources of the past—sewage, food processing wastes, pulp mill wastes, thermal discharges—are scrutinized by point-source discharge permit requirements of environmental agencies. The major challenge will be understanding and controlling highly toxic substances at low concentrations and identifying new types of toxic industrial pollutants. With greater urban and industrial development, concerns about fish health, including lesions, tumors, deformities, will likely increase.

Harvest, either commercial or sport, will always pose a risk to depressed fish populations. The desire to catch fish is always

great, and politicians and managers are reluctant to decrease the public's access to fish resources. Most changes come after severe declines have already occurred. Recent regional fishery management has moved toward more conservative measures than historical harvests.

Introductions of exotic fish that compete with or exclude native species have largely been ignored by the public and are often applauded in the name of sport fishing or biological control. Ranges of introduced species are likely to expand and new species will be introduced. For example, smallmouth bass are voracious predators and are increasing in the Willamette and Columbia River systems. Their impacts on native species are poorly understood. Potential dangerous non-indigenous species, such as zebra mussels, have been found in neighboring states and the risk of introduction in Oregon is high.

Strengths

The status of fish communities in Oregon is strengthened by the large public land base, wilderness areas in mountainous parts of the landscape, major regional conservation plans, and intense public concern about public resource management. These factors directly affect species in mountainous landscapes but are less relevant for species in lowland rivers and streams. Intense public concern about fish resources is a strength of Oregon, and its influence on the future status of fish is uncertain but important.

What data are available and how complete are they?

Major data sources for fish populations in Oregon are 1) distributional data, 2) abundance of migratory species over dams or through ladders, 3) spawner surveys, 4) commercial catch, 5) habitat surveys, and 6) fish population models. Many of these databases, such as the spawner surveys are statistically reliable and provide time trends. Other data, such as passage numbers, are credible for specific locations. The state has invested heavily in freshwater habitat surveys in recent years and this knowledge base is improving. The lack of any statewide comprehensive monitoring program to systematically track the status of representative, widely distributed species is a major deficiency.

What more do we need to understand?

Most of our knowledge of fish populations deals with anadromous salmon and trout and species in forested habitats. Population status and habitat relationships in lowland streams and large rivers are extremely poorly understood. Given the obvious human population increases and development of lowlands, increased attention to these landscapes is critical.

Relationships between toxic contaminants and health of both fish and human communities are extremely important for Oregonians and are poorly understood. With increasing urbanization and industrial development, better understanding of the sources, consequences, and potential solutions is essential.

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