Excerpts from OWEB Watershed Assessment Manual

Basics of Fisheries Resources in Western Oregon

Quality 1995) have been published by state agencies to help understand the technical basis for the standard, and what managers and land owners can do to meet the standard. High dissolved oxygen is a basic physiological requirement of cold-water fishes. Critical dissolved oxygen levels for various ***life stages*** have been evaluated in laboratory and field studies. The early larval stages of fish are wholly dependent on the transfer of oxygen within the ***redd***, the salmonid gravel nest. When oxygen is below saturation, salmonid embryos are smaller than usual and hatching is either delayed or is premature. Salmonid juveniles survive in dissolved oxygen less than saturation, but growth, food conversion efficiency, and swimming performance are adversely affected. Water quality criteria are established to provide for the natural fluctuations below saturation while assuring sufficient dissolved oxygen to protect aquatic life. The concentration of dissolved oxygen is a function of many factors: water temperature, surface and intragravel water interchange, water velocity, substrate permeability, and the oxygen demand of organic material. The content of oxygen in water is directly related to water temperature and barometric pressure, and therefore, temperature and pressure (estimated through elevation) must be measured at the same time.

Toxic Contaminants

Toxic contaminants refer to chemicals introduced by human activities that may be deleterious to people or aquatic organisms. Organic compounds are man-made chemicals that are used for a variety of industrial purposes and as pesticides and herbicides. Metals often occur naturally, but when introduced into the environment or concentrated during mining or industrial processes, they can reach a toxic level. Toxicity covers a range of responses in aquatic organisms, from lethal to sublethal effects. Water quality criteria based on lethal effects are determined by exposing aquatic organisms to the chemical in a laboratory and determining at what concentration 50% of the organisms die. Tests for setting sublethal criteria follow an organism through its life cycle and evaluate the effects on growth and reproduction. These standard toxicity tests are the basis for the majority of water quality criteria recommended by US Environmental Protection Agency (EPA). The State of Oregon has adopted criteria recommended by EPA and listed in a document called the EPA "Goldbook."

Because of the wide variety of organic chemicals, it is not feasible to list the criteria for each chemical in a screening assessment. Establishing the "safe" level for these chemicals is the subject of continuing debate among scientists and there is often little agreement. Therefore, for the screening assessment, the suggested approach is to record the number of times an organic chemical exceeds the detection limits. If a number of these exceedences are recorded, then a water quality specialist or toxicologist should be consulted.

Metals mining, such as gold and silver mines, are located in mineralized zones that may contain other elements such as cadmium, zinc, copper, lead, mercury, and arsenic. These metals can reach groundwater in dissolved form, or in surface waters as dissolved or particulate material. Criteria for metals are expressed as acute and chronic values. Toxicity for most metals is based on the hardness of the receiving water, and therefore the criteria are expressed as a function of hardness.

FISHERIES RESOURCES

Because modifications to watershed process tend to "roll downhill" and influence the stream channel network, it is important to understand the patterns of fish use and the habitat requirements of fish in the watershed. The *Biennial Report on the Status of Wild Fish in Oregon* (Hooten et al. 1995) contains information on over 40 native fish species occurring in Oregon. The salmonids are the most widespread group of fish in the state and best-recognized as an indicator of watershed health. These are a class of fish that include salmon, trout, and ***char***. This assessment process focuses on evaluating salmonid populations and habitat conditions. In areas where there are sensitive nonsalmonid fish species, this approach may be adapted to evaluate the specific needs of those species.

Salmonids have a wide variety of life history patterns (Figure 16). They may be ***anadromous***—spending some portion of their life history in the ocean and returning to freshwater streams to spawn. They may be ***resident*** and spend their entire lives in the stream network. Or they may move between large river systems or reservoirs and the stream network where they were born.

Chinook, coho, steelhead, and cutthroat trout are the most common anadromous salmonids occurring in Oregon. Anadromous chum salmon and kokanee/sockeye salmon also occur in Oregon, but have more limited distributions. Redband (rainbow) trout and interior cutthroat trout are the most common resident salmonids; bull trout also occur in Oregon but have a limited distribution. The life history patterns and distribution in the stream network of the most common salmonids are summarized in Table 1 and described in the following paragraphs (Figure 17). These descriptions are general in nature; it is not uncommon for fish species to have life history patterns adapted to the watershed of origin. For this reason the Fish and Fish Habitat Assessment component asks users to describe the known life history patterns of fish occurring in their watershed. The *Biennial Report on the Status of Wild Fish in Oregon* provides some watershed-specific information and contains more detailed information on the life history patterns of nonsalmonid fish species that may occur in your watershed.

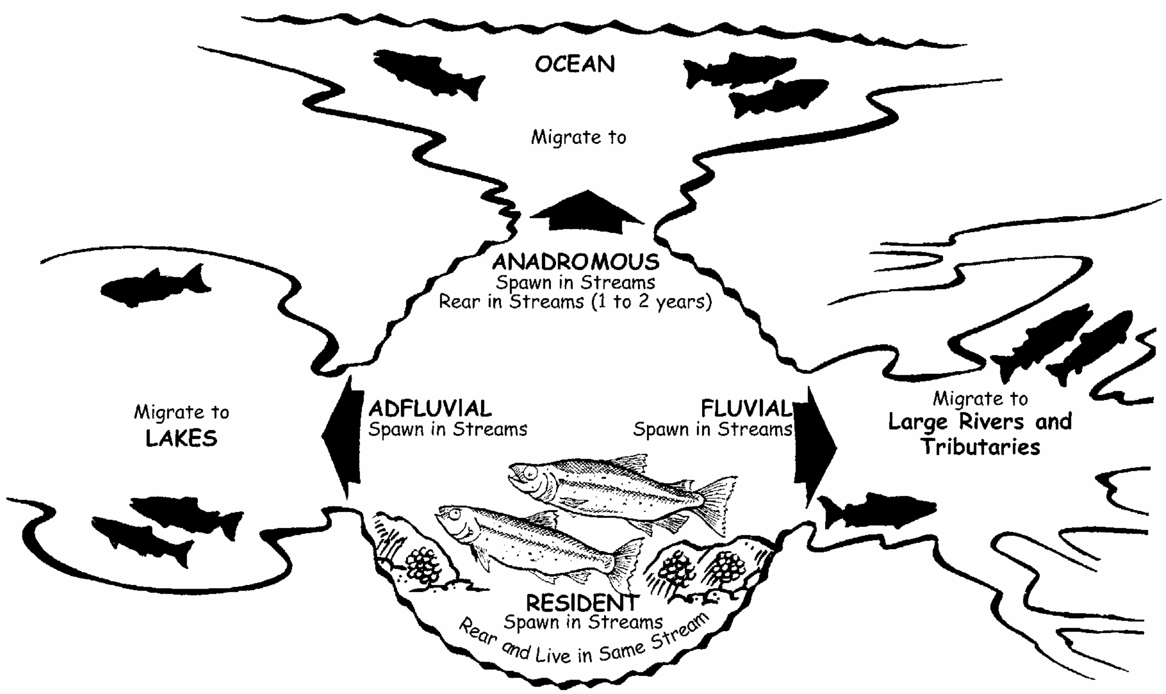


Figure 16. Salmon and trout have three distinct life history patterns: (1) "anadromous," spending some portion of their life history in the ocean and returning to freshwater streams to spawn; (2) "resident," spending their entire lives in the stream network; or (3) fluvial or adfluvial, moving between large river systems or reservoirs and the stream network where they were born.

Table 1. Generalized life history patterns of anadromous salmon, steelhead, and trout in the Pacific Northwest.[1]

Species	Adult Return	Spawning Location	Eggs in Gravel[2]	Young in Stream	Freshwater Habitat	Young Migrate Downstream	Time in Estuary	Time in Ocean	Adult Weight (average)
COHO	Oct-Jan	coastal streams, shallow tributaries	Oct-May	1+yrs	tributaries, main-stem, slack water	Mar-Jul (2nd yr)	few days	2 yrs	5-20 lb (8)
CHUM	Sept-Jan	coastal rivers and streams lower reaches	Sep-Mar	days-weeks	little time in fresh water	shortly after leaving gravel	4-14 days	2.5-3 yrs	8-12 lb (10)
CHINOOK		main-stem large and small rivers			main-stem- large and small rivers		days- months	2-5 yrs	
spring	Jan-Jul		Jul-Jan	1+yrs		Mar-Jul (2nd yr)			10-20 lb (15)
summer	Jun-Aug		Sep-Nov	1+yrs		spring (2nd yr)			10-30 lb (14)
fall	Aug-Mar		Sep-Mar	3-7 months		Apr-Jun (2nd yr)			10-40 lb
STEELHEAD[3]		tributaries, streams, & rivers			tributaries		less than a month	1-4 yrs	
winter	Nov-Jun	Nov-Jun	Feb-Jul	1-3 yrs		Mar-Jun (2nd-5th yr)			5-28 l b(8)
spring	Feb-Jun	Feb-Jun	Dec-May	1-2 yrs		spring & summer (3rd-4th yr)			5-20 lb
summer (Col. R.)	Jun-Oct	Jun-Oct	Feb-Jun	1-3 yrs		Mar-Jun (3rd-5th yr)			5-30 lb (8)
summer (coastal)	Apr-Nov	Apr-Nov	Feb-Jul	1-2 yrs		Mar-Jun (of 2nd-5th yr)			5-30 lb (8)
Inland Columbia STEELHEAD/ REDBAND	Jun-Oct	tributaries	spring	1-3 yrs or resident		1-3rd yr	less than a month	1-4 yrs	
Oregon Basin REDBAND	resident spring		spring	resident		resident	na	na	
Coastal-Sea Run CUTTHROAT	Jul-Dec	tiny tributaries of coastal streams	Dec-Jul	1-3 yrs (2 avg.)	tributaries	Mar-Jun (2nd-4th yr)	less than a month	0.5-1 yrs	0.5-4 lb (1)
Lahontan CUTTHROAT	resident		spring	resident	tributaries, lakes	resident	na	na	
Westslope CUTTHROAT	resident Mar-Jul	small tributaries	Apr-Aug	resident	tributaries	resident	na	na	
BULL TROUT	Jul-Oct	cold headwaters, spring-fed streams	Sep-Apr	1-3 yrs (2 avg.)	prefer water < 15°C	spring, summer, fall (1st-3rd yr)	na	na	0.5-20 lb (varies with form)

1 Life history patterns vary—fish in each watershed may have unique timing and patterns of spawning, growth, and migration. As part of the fish assessment you will update this chart.
2 The eggs of most salmonids take 3-5 months to hatch at the preferred water temperature of 50-55ºF; steelhead eggs can hatch in 2 months.
3 Steelhead, unlike salmon and coastal cutthroat trout, may not die after spawning. They can migrate back out to sea and return in later years to spawn again.

From: StreamNet Web page (www.streamnet.org) – fact sheets

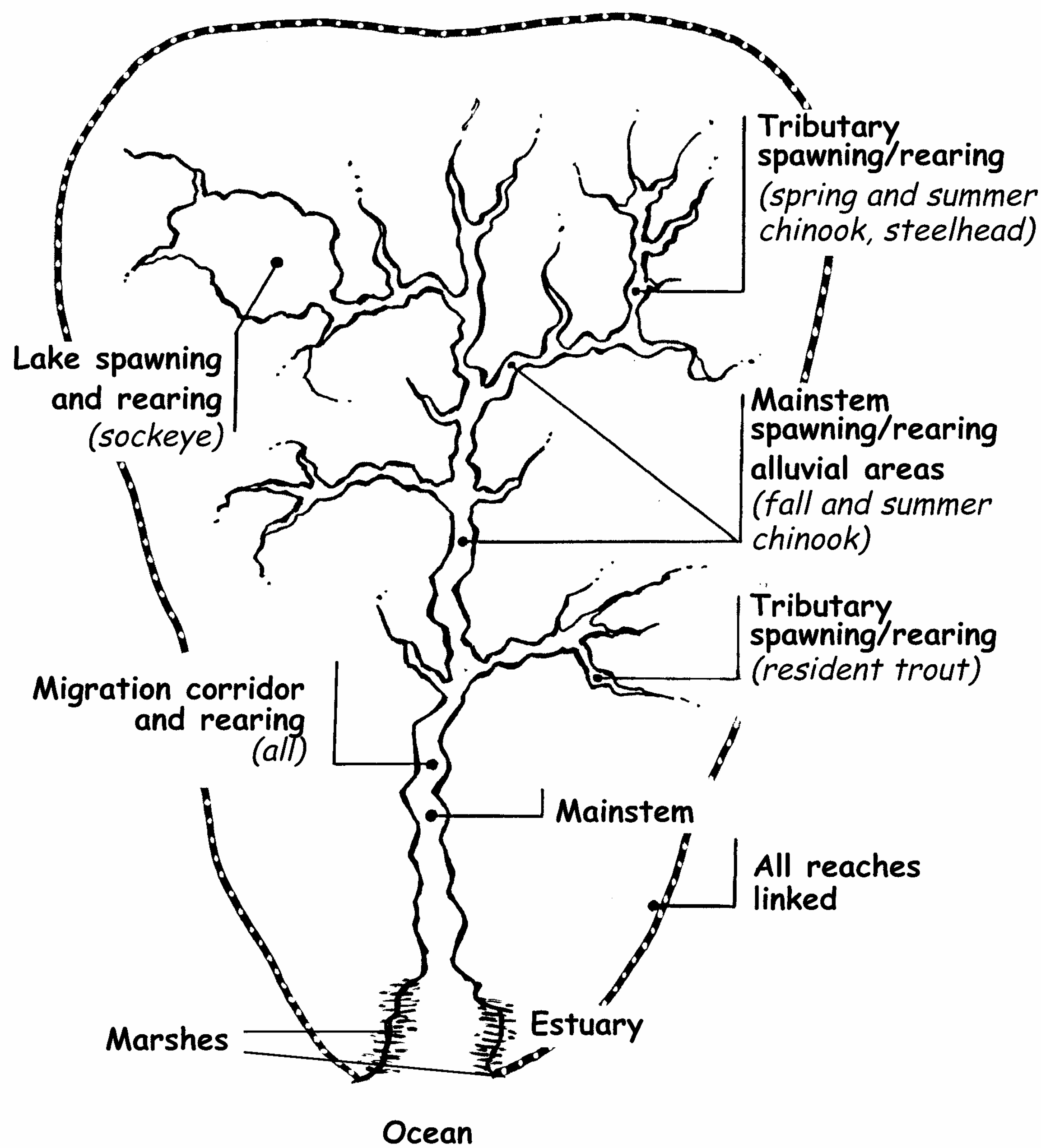


Figure 17. Salmonid distribution in a watershed varies by species and life history stage.

Chinook (king) salmon exhibit a wide range of life history diversity, with variations in the date, size, and age at ocean entry; in adult migration season; in spawning habitat selection; and in age and size at maturity. Chinook have two adult migration seasons, fall or spring, which refers to the period when they return to the watershed. Fall chinook return from the ocean in late August through December and spawn in the late fall and winter. Spring chinook return from the ocean in the spring and adults spend the summer in deep pools until the fall spawning period. Chinook salmon prefer to spawn in large main channels and low-gradient (less than 3%) tributaries. Spring chinook are typically good jumpers and can leap significant barriers in streams that would be impassable to fall chinook. Generally, juvenile chinook of coastal stocks rear in coastal streams from 3 to 6 months and rear in estuaries from 1 week to 5 months. Nearly all coastal chinook stocks enter the ocean during their first summer or fall. Some coastal and Columbia River spring chinook spend one summer and one winter in fresh water. Chinook adults range from 2 to over 70 pounds, with the average size ranging from 10 to 40 pounds.

Coho (silver) salmon usually spawn from November to February. Coho prefer to spawn and rear in small, low-gradient (less than 3%) tributary streams. Adults are good jumpers and often ascend higher-gradient reaches to access spawning areas in the upper portions of a watershed. Adult coho may spend several weeks to several months in fresh water before spawning, depending on the distance they have to migrate to their spawning areas. Juveniles normally spend one summer and one winter in fresh water. They migrate to the ocean in the spring, 1 year after ***emergence***. Most adults mature at 3 years of age, but some males mature as jacks or precocious males. Coho adults rarely exceed 15 pounds.

Steelhead/Rainbow/Redband: The rainbow trout species consists of multiple subspecies that are closely related fish that exhibit differences in life history patterns, distribution, and/or body form. Currently, three subspecies of rainbow trout are recognized in Oregon: (1) coastal steelhead/rainbow trout, (2) inland Columbia Basin redband/steelhead trout, and (3) Oregon Basin redband trout.

> **Coastal steelhead** are seagoing rainbow trout that occur west of the Cascade Mountains and have a wide variety of fresh- and saltwater rearing and adult migration strategies. Juvenile steelhead may rear 1 to 4 years in fresh water before migrating to saltwater. Steelhead may reside in saltwater 1 to 3 years. Adult steelhead that enter fresh water between May and October are called "summer-run" fish. These fish hold several months in fresh water prior to spawning. Adults that enter between November and April are called "winter-run" fish. These fish are more sexually mature when they go upstream and they stay in fresh water for a shorter time before spawning. Steelhead return to saltwater after spawning. Resident rainbow trout remain in the same stream network throughout their entire life. Rainbow trout typically spawn in the winter or spring. Both rainbow and steelhead spawn more than once.
>
> **Inland Columbia Basin redband/steelhead** occur in the Columbia Basin east of the Cascade Mountains. This subspecies includes anadromous steelhead and resident redband trout, both of which can occur in the same stream system. There are also isolated redband trout populations in streams that are above barriers to anadromous fish. Juvenile steelhead before returning to fresh water to spawn. Most inland steelhead are summer-run fish, entering fresh water between March and October and holding for several months prior to spawning. Only four populations of winter-run steelhead are found in Oregon; these populations occur in Fifteenmile Creek and adjacent creeks.
>
> **Oregon Basin redband trout** occur in the following basins: Klamath, Summer Lake, Abert Lake, Fort Rock Valley, Christmas Valley, Fossil Lake, Silver Lake, and Malheur. Populations in each of these basins are completely isolated by natural geological features, except for the Klamath Basin. These trout are adapted to thrive in the often warm and alkali waters of the Great Basin streams where they occur. Historically, these redband trout populations had ***adfluvial*** life histories, which means they migrated between the spawning areas in streams to rearing areas in lakes and marshes. The diking, channeling, irrigation

diversions, and draining of marshlands that have occurred extensively in these basins has resulted in the loss of rearing habitat and functional migration corridors.

Cutthroat trout have three subspecies occurring in Oregon: (1) coastal cutthroat trout, which occur west of the Cascade Mountains; (2) Lahontan cutthroat trout, occurring in southeastern Oregon, and (3) westslope cutthroat trout, which occur in the John Day Basin.

Coastal cutthroat trout have variable life history patterns. Some migrate to the ocean while others remain in the same area of a stream all of their lives. They spawn in the spring or fall and the juveniles emerge by June or July. Cutthroat trout tend to spawn in very small tributaries. Sea-run cutthroat trout rarely exceed a length of 20 inches or a weight of 4 pounds.

Lahontan cutthroat trout occupy remnant streams in the basin of historical Lake Lahontan. These fish have evolved a tolerance to high alkaline conditions. Lahontan cutthroat tend to be small-sized and occupy small streams that usually have no other fish species present.

Westslope cutthroat trout only occur in the John Day Basin in Oregon. These populations all have a resident life history and remain in the same stream system their entire lives. Westslope cutthroat are specialized to feed on insects and other invertebrates, while the other cutthroat subspecies occurring in Oregon prefer to feed on other fish.

Bull trout are a char closely related to trout. Researchers believe the bull trout populations in Oregon became established during the last glacial period, which helps explain why they need cold water to successfully reproduce. Bull trout in Oregon have three distinct life history patterns: They may be (1) adfluvial fish that migrate between lakes or reservoirs and spawn in streams, (2) ***fluvial fish*** that migrate to large rivers and spawn in small tributaries, or (3) resident fish that remain in the same stream network for their entire lives. The migratory forms of bull trout move long distances to reach their spawning tributaries. Typically, bull trout occur farther upstream in the watershed than other salmonids. Bull trout grow slowly, do not mature until age 5 or older and will live for 12 or more years. They typically spawn in the fall as water temperatures are decreasing, and can spawn annually or in alternate years. Bull trout are predatory on other fish and can grow to 30 pounds where adequate food is available.

There are many elements of in-stream fish habitat that affect the production of salmonids during the freshwater phases of their life history (Figure 18). Physical habitat features include depth and water velocity ranges (usually grouped by channel units), cover, spawning gravels, and temperature ranges. The Oregon Department of Fish and Wildlife has compiled extensive amounts of stream habitat data from over 5,000 miles of stream surveys and has developed a series of ***benchmark*** values for key physical habitat conditions. The Fish and Fish Habitat Assessment component uses these benchmark values as a comparison in order to evaluate the current condition of fish habitat in the watershed.

See Fish and Fish Habitat component for habitat evaluation process.

It is clear from the descriptions of the life histories that the anadromous trout and salmon occurring in Oregon watersheds migrate long distances upstream and downstream during their life cycles.

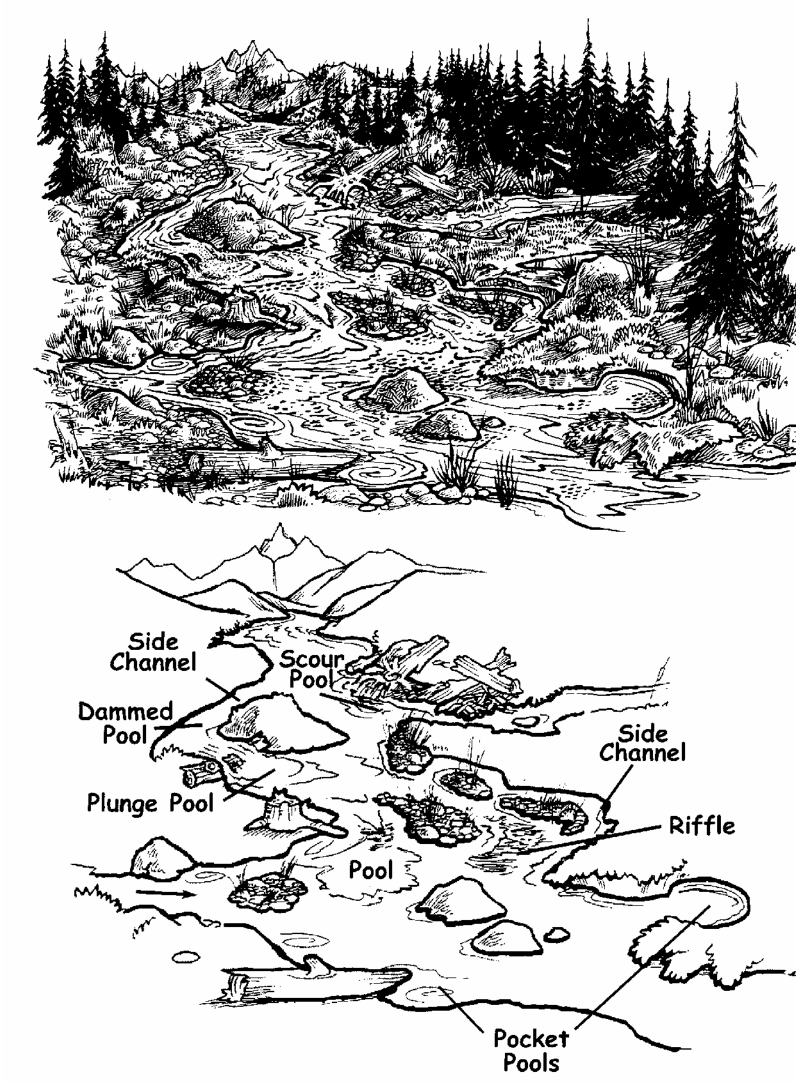
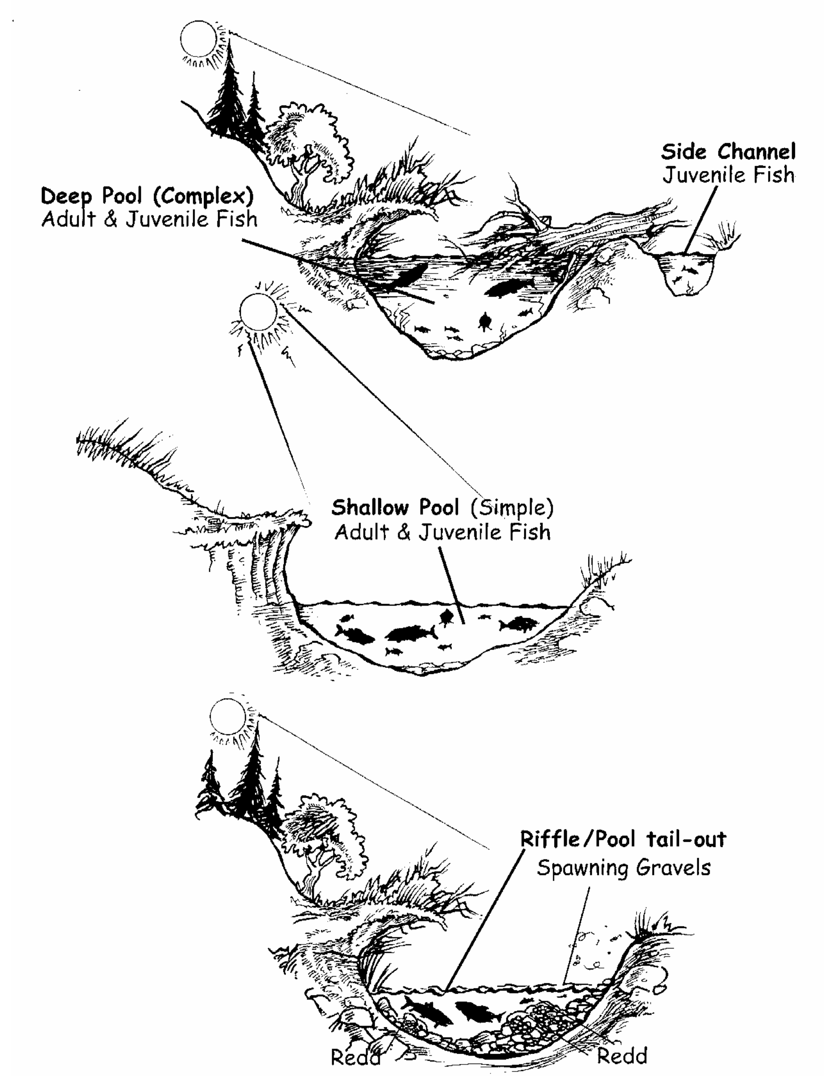


Figure 18. Elements of in-stream fish habitat that affect salmonid production in fresh water include depth and water velocity, cover, spawning gravels, and temperature ranges.



These conditions are dependent on such physical characteristics as pools and side channels, substrate, and riparian vegetation.

Resident trout will also move up and downstream to seek food, shelter, and spawning. Culverts under roads can block fish passage through a number of factors, including jumps, no resting pools, insufficient depth, excessive water velocity, or a combination of these factors (Figure 19). The migration barrier portion of the Fish and Fish Habitat Assessment provides a protocol for mapping potential barriers, and identifying if an existing crossing is a barrier.

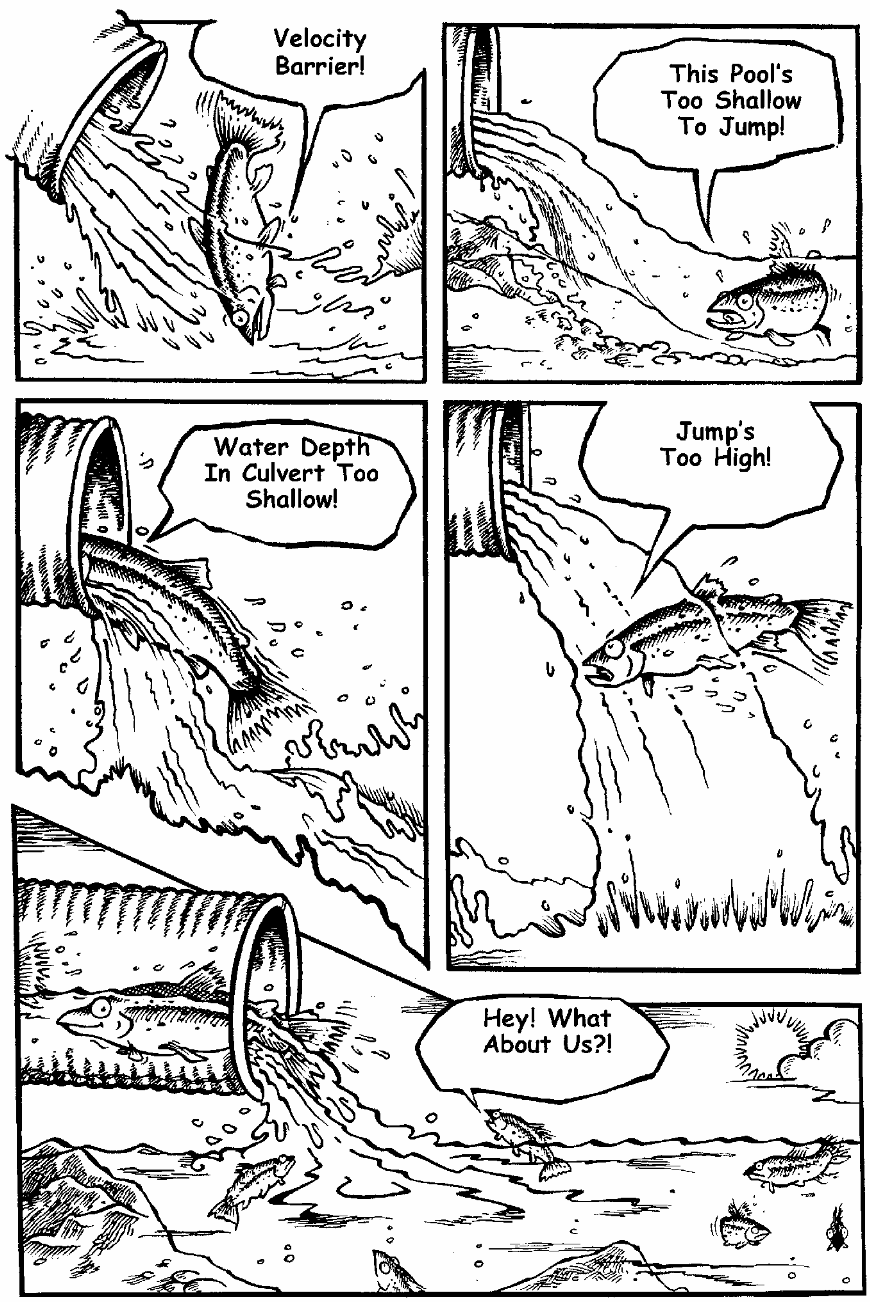


Figure 19. Culverts under roads can block fish passage through a number of factors, including excessive water velocity, insufficient depth, excessively high jumps, or a combination of these factors.

Table 2. Summary of potential stream impacts from human activities.

Human Activity	Potential Disturbances	Potential Habitat/Watershed Process Responses
Timber harvest	• removal of riparian zone canopy cover • soil disturbance, increased erosion of fine sediments • alteration of total basin vegetation cover	• increased summer water temperatures • reduced woody debris recruitment potential • decrease in interstitial spaces and pools (spawning and rearing habitat) • alteration of timing and magnitude of peak flows (hydrology) • change in timing and characteristics of landslides
Transportation (road development, rail, bridges, etc.)	• surface erosion, increased fine-sediment inputs • destabilization of upslope areas increased coarse- and fine-sediment inputs • blockage of migratory corridors (culverts) • loss of riparian vegetation • chemical spills, toxics, nutrient runoff	• decrease in interstitial spaces and pools (spawning and rearing habitat) • major channel disruption & catastrophic loss of habitat with major events • loss of migratory population component • increased summer water temperatures • reduced woody debris recruitment potential • chemical contamination • changes in peak flows
Agriculture/livestock grazing	• bank damage • soil compaction • in-channel stream bed disruption • removal of bank vegetation • changes in vegetation species & distribution	• decreased bank stability & direct inputs of fine sediments • reduced water infiltration, changes in peak flows, reduced baseflows • loss or disruption of summer rearing habitat • loss of cover, increased summer water temperatures & formation of anchor ice • increased stream nutrients
Agriculture/crops	• soil compaction • surface erosion, increased fine-sediment inputs • removal of bank vegetation • chemical, nutrient runoff	• decreased bank stability & direct inputs of fine sediments • reduced water infiltration, changes in peak flows, reduced baseflows • loss of cover, increased summer water temperatures & formation of anchor ice • increased stream nutrients, contamination
Mining	• streambed disturbance • fine-sediment inputs • chemical runoff or seepage to groundwater	• loss or disruption of spawning & summer rearing habitat • creation of chemical barriers &/or direct fish mortality, groundwater contamination
Dams (hydroelectric development, water supply, irrigation diversions)	• blockage of migratory corridors • changes in temperature, sediment delivery, flow regime due to dam regulation • increased temperatures, fine sediments, chemicals and nutrients with wastewater returns • channel dewatering	• loss of migratory/anadromous population component • overall decrease in habitat condition • direct mortality loss of one or more year-classes, reduction of redds, loss of available habitat • loss of anadromous prey base/nutrients • loss or disruption of spawning & summer rearing habitat

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Table 2. (continued).

Human Activity	Potential Disturbances	Potential Habitat/Watershed Process Responses
Urbanization, channelization, diking, levees, recreation, & other	• reduction / removal of riparian vegetation • direct streambed modification • dewatering • stormwater runoff, reduced infiltration to soils	• increased summer water temperatures & formation of anchor ice • habitat simplification • reduced channel stability, channel incision • chemical, nutrient, bacterial inputs • increased magnitude and frequency of peak flows • reduced baseflows
UTILIZATION/HARVEST		
Fishing harvest	• direct mortality	• reduced recruitment & loss of nutrients to the stream
SPECIES INTERACTIONS		
Exotic species introductions, hatchery production	• competition • hybridization • predation • disease • water pollution	• displacement from most favorable habitats • sterile or less fit hybrids • direct mortality • weakness • nutrient, dissolved oxygen, and chemical contamination
HISTORICAL HUMAN USES (modifications that may not be apparent without historical research)		
Splash damming & log drives, yarding up stream channels, channel dredging, harvest of stream-bank trees, agriculture	• channel scour • streambed damage • removal of riparian vegetation • bank destabilization	• long-term loss or disruption of spawning & summer rearing habitat • increased summer water temperatures & formation of anchor ice • reduced woody debris recruitment potential • decrease in interstitial spaces and pools (spawning and rearing habitat)
Water withdrawals/ channel dewatering	• dry channel	• migration barriers, loss of one or more year-classes of fish
Stream cleaning to remove wood	• reduced sediment retention • increased channel scour • reduced channel complexity	• loss or disruption of spawning, summer & winter rearing habitat
Placer (hydraulic) mining or gravel quarries	• streambed disturbance • substrate removal	• loss or disruption of spawning & summer rearing habitat
Beaver eradication	• dam deterioration, removal • loss of pond/wetland areas	• loss of rearing habitat • alteration of water retention/floodplain function • temperature increases
Tailings deposits	• fine-sediment inputs • toxic contaminants	• loss or disruption of spawning & summer rearing habitat • creation of chemical barriers &/or direct fish mortality

APPENDIX I-A: BACKGROUND ON STATE AND FEDERAL REGULATORY ISSUES

The Oregon watershed assessment is targeted at “aquatic resource issues.” Fish and water quality are the primary drivers for watershed assessment and restoration in Oregon. The assessment process focuses on evaluating watershed processes that influence the ability of the watershed to produce clean water and support fish populations. This appendix summarizes the regulatory policies that direct aquatic resource protection at the state and federal level. Numerous other laws regulate land management activities, such as the National Environmental Policy Act or local planning and zoning regulations, which are not discussed here. These other laws will influence what restoration actions can be taken and how they are conducted.

Fisheries

Federal Endangered Species Act

The Endangered Species Act (ESA) of 1973 provides for listing of native animal and plant species as endangered and provided means for their protection.[1] The US Fish and Wildlife Service (USFWS; responsible for inland fish, wildlife, and plants) and the National Marine Fisheries Service (NMFS; responsible for marine and anadromous fish and marine mammals) are the designated federal agencies responsible for administering the law. The key components of the ESA include the following:

1. Defining categories of “endangered” and “threatened,” and listing populations.

2. Requiring all federal agencies to undertake programs for the conservation of endangered and threatened species.

3. Prohibiting these agencies from authorizing, funding, or carrying out any action that would jeopardize a listed species or destroy or modify its “critical habitat.”

Before proceeding on any action that may affect endangered species, federal agencies must “consult” with the NMFS or USFWS. Consultation is a formal process that evaluates the effects of the action and determines if the activity needs to be modified to reduce the potential effect on the organism. In addition, the ESA applies broad “taking” prohibitions to all threatened or endangered animal species. In Oregon, there are 25 species of fish, 8 species of birds, 5 species of mammals, and 14 species of plants listed or proposed for listing under the ESA at the time of this writing.

Oregon State Endangered Species Programs

The Oregon Endangered Species Act of 1987 (ORS 496.172) gave the Oregon Department of Agriculture (ODA) responsibility and jurisdiction over threatened and endangered plants. The Oregon Department of Fish and Wildlife (ODFW) has responsibility for threatened and endangered fish and wildlife. Both of these agencies have entered into cooperative (Section 6) agreements with the USFWS to continue research and conservation programs for animal and plant species under the

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[1] The ESA defines endangered as any species (except insects) “in danger of extinction throughout all or a significant portion of it range,” and as threatened any likely to become endangered “within the foreseeable future throughout all or a significant portion of its range.”

federal ESA. The Oregon Natural Heritage Program (ONHP) has a similar agreement with the USFWS for invertebrates.

The ODFW maintains a list of threatened and endangered species; currently 35 species of fish and wildlife are on the list. The Oregon act requires state agencies to develop programs for the management and protection of endangered species, and requires agencies to comply with guidelines adopted by the Oregon Fish and Wildlife Commission for threatened species. The Oregon Fish and Wildlife Commission has provided criteria for listing and delisting species, and for protecting listed species.

The Oregon Fish and Wildlife Commission has also adopted a rule requiring the department to develop and maintain a state list of sensitive species for vertebrates. Sensitive species constitute naturally reproducing native vertebrates that are likely to become threatened or endangered throughout all or a significant portion of their range in Oregon. The sensitive species list, which is divided into four categories (see sidebar), is for the express purpose of encouraging actions that will prevent further decline in species' populations and/or habitats, thus avoiding the need for listing.

OREGON STATE SENSITIVE SPECIES CATEGORIES

Critical (SC)—Species for which listing as threatened or endangered is pending; or those for which listing as threatened or endangered may be appropriate if immediate conservation actions are not taken.

Vulnerable (SV)—Species for which listing as threatened or endangered is not believed to be imminent and can be avoided through continued or expanded use of adequate protective measures and monitoring.

Peripheral or Naturally Rare (SP)—Peripheral species are those whose Oregon populations are on the edge of their range. Naturally rare species are those which had low population numbers historically in Oregon because of naturally limiting factors. Maintaining the status quo for the habitats and populations of these species is a minimum requirement.

Undetermined Status (SU)—Animals in this category are species for which status is unclear. They may be susceptible to population decline of sufficient magnitude that they could qualify for endangered, threatened, critical, or vulnerable status, but scientific study will be required before a judgement can be made.

Water Quality Laws and Programs

Federal Clean Water Act

The 1972 Federal Clean Water Act (CWA) as amended gives the state responsibility for setting water quality standards and developing water quality management programs which ensure that the goals of the CWA are met. Recent judicial actions have focused attention on listing of impaired waters under Section 303(d) of the CWA. States in the Pacific Northwest, including Oregon, have significantly increased the number of stream segments that are designated as water quality limited under the provisions of the act. Listing of the stream segment as water quality limited requires the state to prepare a Total Maximum Daily Load (TMDLs) plan or a water quality management plan that will function as a TMDL plan for nonpoint sources (e.g., forestry, agriculture, grazing, and untreated urban stormwater runoff). Information collected during a watershed assessment can be used to assist the state in evaluating the status for listing and in developing the management plans required under the act. In addition, Section 404 of this law regulates the discharge of fill material into wetlands and other "Waters of the United States."

Oregon Department of Environmental Quality

In Oregon, the Department of Environmental Quality (ODEQ) has the responsibility for developing standards that protect beneficial uses such as drinking water, cold-water fisheries, salmonid spawning, industrial water supply, recreation, and agriculture. The state must monitor water quality and review available data and information to determine if the standards are being met. Section 303(d) of the CWA requires the state to develop a list of waterbodies that do not meet standards, and to submit an updated list to the US Environmental Protection Agency (EPA) every 2 years. The list provides a way for Oregonians to identify problems and develop and implement watershed recovery plans to protect beneficial uses while achieving federal and state water quality standards. There are 1,067 streams and rivers, 32 lakes, and 1,168 stream segments on the 1998 303(d) list, which covers 13,892 miles of streams in Oregon.

The 303(d) list is a useful source for identifying water quality issues that are important in the watershed. The list identifies the parameter, the basis for the listing, and information that supported the listing. The watershed assessment can be useful in part to evaluate the basis for listing, evaluate the adequacy of supporting data, and establish a monitoring plan to fill data gaps. The programs described below and in the sidebars on pages 5 and 6 have been developed to provide solutions to these issues.

Relationship of Watershed Assessment to TMDL Requirements

Watershed assessment can be an important tool in completing the planning and assessment elements for TMDL plans required under the CWA. State agencies have developed watershed management plans to respond to these requirements for nonpoint source watersheds. Several of these initiatives led to watershed planning documents which have similar names, but may differ in their content and standing in fulfilling the requirements of the CWA. It is useful to review the intended purpose of these programs, then identify the potential role that watershed assessment can play in resolving these issues.

Section 303(d) Requirements

Section 303(d) of the 1972 federal CWA requires states to develop a list of waterbodies that cannot meet water quality standards without application of additional pollution controls. These waters are referred to as "water quality limited" and must be periodically identified in each state. In Oregon, this responsibility rests with the ODEQ. Water quality limited waters requiring the application of a TMDL plan are identified in the 303(d) list. This list, developed by the ODEQ, is subject to public review and must be approved by EPA.

The 303(d) list is really a subset of the larger list of water quality limited waters. These waters are defined **not** by whether they meet the standards, but by whether treatments above and beyond "best available technology" and normally applied "best management practices" are required to protect beneficial uses. In other words, a waterbody will retain its water quality limited status so long as the attainment of water quality standards requires a heightened level of treatment or watershed management, even if standards are currently being met or a TMDL plan is being implemented. Those waters that (1) don't meet standards and (2) haven't yet received TMDL plans or equivalents are placed on the 303(d) list. The other water quality limited waterbodies will still be identified in ODEQ's regular Water Quality Status Assessment (305[b]) report.

A full TMDL development process determines the pollutants causing water quality impairments, identifies maximum permissible loading capacities for the waterbody in question, and then, for each relevant pollutant, assigns load allocations to each of the different sources, point (e.g., sewage treatment plants, industrial facilities) and nonpoint, in the watershed. Different TMDL development processes will be used in different situations depending on the types of sources involved. More complex and lengthy processes are required where the contributions of both point sources and nonpoint sources make the situation complex. Where only nonpoint sources are involved, the TMDL development process will generally be less complex, although a thorough understanding of the watershed and its water quality are necessary in either case.

Water Quality Management Area Plans

In 1993, the state legislature approved Senate Bill (SB) 1010, which requires the Oregon Department of Agriculture (ODA) to help reduce water pollution from agricultural sources and improve overall watershed conditions in various areas throughout the state. SB 1010 directs ODA to work with farmers and ranchers to develop overall agricultural water quality management area plans for watersheds that are required by state or federal law to have such plans in place.

Landowners who conduct agricultural activities within areas delineated by ODA where an agricultural water quality management area plan is in place are required to perform activities in conformance with the plan. The goal of a plan is to improve the overall health of the watershed; specific practices will not be prescribed to landowners as long as the goal is being met. However, landowners contributing to water quality problems who do not take voluntary steps to address problems may be subject to specific compliance orders and/or enforcement action. Other regulatory and nonregulatory programs are explained in the following sidebars.

OTHER WATER QUALITY PROGRAMS

Comprehensive Land Use Plans

These plans, required for all areas of Oregon by state law, address the protection and management of a number of natural resource values, including water resources. Developed by cities and counties in accordance with statewide goals and guidelines, these plans are based on detailed inventories and are implemented through enforceable local ordinances which govern the location and execution of many land use and land management activities. Under these plans, local governments must develop storm water treatment plans.

Oregon Forest Practices Act (FPA)

The forestry practices resulting from this program have been conditionally approved by EPA as the “best management practices” (BMPs) for water quality protection on state and private forest lands within the boundary of the Coastal Nonpoint Source Control Program. Water quality protections in federal forest practices must meet or exceed the effectiveness of the FPA practices. The Oregon Department of Forestry has already served as the lead agency for TMDL development on state and private forest lands in several basins.

Public Land Management Plans

Between them, the US Forest Service and Bureau of Land Management manage over 50% of Oregon’s land area, and federal lands in national parks, federal wildlife refuges, and military reservations are another 5% or 6%. These federal lands are a large majority of the area in many rural watersheds. Federal laws require detailed management plans for these lands, and the law also requires that the plans be consistent with the Clean Water Act and with state environmental protection programs.

NONREGULATORY STATE FISHERIES AND WATERSHED PLANS

Oregon Plan for Salmon and Watersheds (Oregon Plan)

The Oregon Plan originated in 1995 as an effort to address declining populations of coastal coho salmon. The plan has been expanded to include nonlisted coho populations and declining steelhead populations. The goal of the plan is to restore fish populations to productive and sustainable levels that will provide environmental, cultural, and economic benefits. While the Plan focuses on the needs of salmon, it is designed to conserve and restore crucial elements of natural systems that support fish, wildlife, and people. The Oregon Plan relies on four fundamental approaches to accomplish the goal of securing and protecting healthy fish habitat: (1) community-based action, (2) government coordination, (3) monitoring and accountability, and (4) making improvements over time. Watershed councils play a key role in developing watershed restoration plans and engaging landowners in restoration actions. This watershed assessment guide is being developed as a tool to assist watershed councils in conducting the assessment as a necessary first step to implementing meaningful restoration activities. The Healthy Streams Partnership described below is a component of the Oregon Plan.

Healthy Streams Partnership

The Healthy Streams Partnership was formed in an effort to find cooperative solutions to water quality problems. The partnership is made up of representatives from the agricultural community, forestry, environmental groups, local government and state agencies, and the governor's office. The partnership uses existing regulations under the departments of Agriculture, Forestry and Environmental Quality to address waterbodies that currently do not meet water quality standards. The partnership provides support to state agencies and, at the same time, ensures that landowners and other individuals will have extensive opportunity for input into decisions. Restoring Oregon's waters will meet the requirements of the federal Clean Water Act, settle lawsuits related to the act, and help ensure success of the Oregon Plan for Salmon and Watersheds to restore salmon and steelhead runs.

Governor's Watershed Enhancement Board (GWEB)

By providing grant funds, technical assistance, and information, GWEB supports the work of watershed councils and other parties and is the primary source of state funding for investment in a variety of watershed enhancement projects. GWEB is designed to work closely with the Healthy Streams Partnership and the Oregon Plan for Salmon and Watersheds.