Strategy Habitat: Freshwater Aquatic Habitats

Ecoregions:

Freshwater aquatic habitats are a Strategy Habitat throughout the state (all eight ecoregions).

General Characteristics:

Freshwater aquatic habitats include rivers, streams, ponds, lakes and reservoirs, and are defined as occurring above the influence of tides and salinity fluctuations. Freshwater aquatic habitats typically contain water year-round, while wetlands may dry out through the season.

Oregon's freshwater aquatic habitats are both interconnected and highly diverse, including tributary streams and lakes at high elevations, major rivers, smaller meandering streams, springs, seeps, and many lakes and reservoirs. The headwaters of many of Oregon's streams and rivers are located in the Cascades mountain range, and many drainage basins empty into the Columbia River and eventually into the Pacific Ocean. In the southeastern portion of the state, many small closed basins contain streams that flow from the mountains into valleys without any outlet to the ocean. Numerous lakes occur throughout Oregon, formed by glaciation, lava flows, and human-made structures such as dams. Crater Lake and Waldo Lake are Oregon's two clearest lakes, both located in the West Cascades ecoregion. The eastern half of the state contains several playa lakes, formed when runoff from precipitation and mountain snowpacks flows into low-lying areas, then evaporates and leaves mineral deposits.

Conservation Overview for Freshwater Aquatic Habitat:

Water is crucial for all fish and wildlife, and high quality freshwater aquatic systems provide essential habitat to many at-risk species, including important spawning and rearing habitat for salmonids, breeding habitat for amphibians, and habitat for freshwater mussels and other invertebrates. In many locations, flow and hydrology have been impacted by barriers (e.g., roads, dams and culverts) and irrigation diversions that can reduce water flow and interfere with fish and wildlife migration. Channelization and development can restrict the natural ability of streams and riparian habitats to meander over time, limiting the quality and availability of these habitats, as well as affecting floodplain function. Large, cool freshwater pools, often associated with streams, are also in decline. Upland habitats have a critical role in watershed function and affect aquatic habitats by providing shade and filtering runoff and precipitation. These benefits can be particularly important in drier, low-elevation sites, where shading can protect streams from high temperatures during periods of low flow in the late summer.

In the Coast Range, abundant coastal lakes are highly sought out for development, and many are now surrounded by houses or pastures. The Rogue and Umpqua rivers were once internationally known commercial salmon fisheries, providing abundant high quality freshwater habitat. Today, strong sport fisheries continue in these watersheds. The West Cascades ecoregion has the highest water quality in the state and probably the fewest problems with water allocation and quantity. This high-quality water comes from the upper reaches of rivers and streams, which are typically managed as protected areas under public ownership. In many parts of the state, restoring flows and improving the quality of riparian habitats on lower rivers improves and maintains ecological connections to high-quality habitat associated with headwater streams.

In some parts of the state, urbanization, agriculture and forest practices have placed many demands upon aquatic systems. Since the 1960s, efforts to clean-up the Willamette River have greatly reduced pollutant levels. However, nonpoint source pollution, including runoff from urban and agricultural activities, continues to contribute to poor water quality in some areas. Water quality planning by Oregon Department of Agriculture and Oregon Department of Environmental Quality offer solutions and identify local partners.

Limiting Factors in Freshwater Aquatic Habitat:

Factor: Water quantity: Water is limited in some parts of the state. Low flows are associated with higher water temperature and have higher nutrient concentrations. Late summer is a time of particular

concern because of reduced late-season flows. For example, in the Northern Basin and Range, surface water is fully allocated to multiple uses (including dams and storage). Additionally, in the Willamette Valley, groundwater has become less readily available because of increased impervious surface, impacting natural hydrological regimes. Also, some streams have been diverted in pipes or re-aligned for drainage ditches, further altering hydrology.

Approach: Where possible, maintain flow following the natural hydrological cycle. Minimize release of unnaturally warm water in the fall and summer by altering intake/release structures. Improve irrigation efficiency. Lease water for instream use. Provide incentives and information about water usage and sharing at key times of low flow conditions (e.g., late summer). Increase interaction of rivers and floodplains. Reduce stormwater runoff and increase permeability in urban areas, allowing more water to seep into the ground. During restoration, remove pipes and provide stream channels to promote flow, nutrient and oxygen exchange. Where possible, provide sufficient room to restore meanders and other functions.

Factor: Water quality: Nonpoint source pollution sometimes contains fertilizers, pesticides or oil-based pollutants at levels high enough to cause significant lethal or sub-lethal effects in native fish and wildlife. Point source pollution from industrial practices also can contain high levels of contaminants. Both point and nonpoint source pollution are of particular concern in more highly populated regions. In some areas, particularly the Rogue and its tributaries, increasing use of recreational motor vehicles (jet boats) has the potential to degrade water quality with runoff, or to harass aquatic or riparian-associated wildlife.

Approach: Increase awareness of the impacts of urban runoff and pesticide applications; increase awareness and manage timing of applications of potential aquatic contaminants. Improve compliance with water quality standards and pesticide use labels (Oregon Department of Environmental Quality [ODEQ] and U.S. Environmental Protection Agency). Work on implementing Senate Bill 1010 (Oregon Department of Agriculture) and ODEQ Total Maximum Daily Load water quality plans. Carefully consider recreational vehicle use and timing on sensitive or "wild and scenic" water bodies.

Factor: Invasive species: Invasive species (e.g., bass, crappie, bluegill, yellow perch, brown bullhead, carp) can compete with or hybridize with native fish (e.g., steelhead, rainbow trout). For example, in the Columbia Basin, non-native carp can overgraze aquatic vegetation and stir up sediment, depriving native fish and amphibians of egg laying sites or preventing eggs from absorbing enough oxygen to develop. Alterations in hydrology can make the habitat more susceptible to invasive plants, invertebrates, or fish. Some of these invasive species can present problems when they compete with, forage upon, or hybridize with native fish and wildlife.

Approach: Restoration of aquatic habitats to conditions that support native fish and wildlife is the best strategy to prevent invasive species. Maintaining historic hydrological regimes ensures that habitat conditions best support native fish and wildlife. Work with multiple partners to restore flow and water input levels. Where necessary, work to minimize predation on sensitive native species. Where non-native fish threaten native Strategy Species, consider site-appropriate tools such as mechanical treatment, or chemical treatment in places and seasons where it will not harm native amphibians, fish or invertebrates. Educate and inform people about the problems that can be caused by non-native fish.

The Grande Ronde Model Watershed Program

In northeastern Oregon, the Grande Ronde Model Watershed Program is developing and implementing projects to restore proper watershed functions and provide spawning, rearing and migration habitat for endangered salmonids. The Program is a public policy group chartered by the Boards of Commissioners of Wallowa and Union Counties and designated by the Northwest Power Planning Council (now the Northwest Power and Conservation Council). Board Members include representatives of local government, state and federal agencies, private landowners, Tribes, conservation interests, public interest groups, educators, and Soil and Water Conservation Districts. The mission of the program is to oversee and develop the implementation, maintenance, and monitoring of coordinated resource management in the Grande Ronde and Imnaha Sub Basins. Monthly meetings of the Board guide the Program in its work with the Oregon Watershed Enhancement Board, the Bonneville Power Administration, the Governor's Office and partner across the watershed(s). Some major results achieved between 1994 and 2002 include more than 2,700 miles of riparian habitat improvements and over 50 fish passage improvements. Current plans in development include restoration projects on Catherine Creek, Bear Creek, End Creek, the Lostine River, Trout Creek, Wallowa River and Imnaha River, and others. These projects are tied directly to sub-basin Plans, watershed assessments, and the Oregon Plan for Salmon and Watersheds.

Factor: Water temperature: Water temperature often is too warm for native aquatic life because of alterations in stream flow, thermal pollution or reduced riparian cover. In the Blue Mountains, East Cascades and Columbia Plateau ecoregions, late summer is a time of particular concern for increased temperatures, partially due to reduced late-season flows. In the Northern Basin and Range ecoregion, conditions of low flow can lead to problems with increased levels of bacteria and pollutants. Determining optimal water temperatures is difficult because of a lack of understanding about historical temperature regimes.

Approach: Maintain or increase riparian cover. Where appropriate, re-vegetate degraded riparian areas. Minimize release of unnaturally warm water in the fall and summer by altering intake/release structures. Maintaining and restoring in-stream flow contributes greatly to maintaining favorable water temperatures.

Factor: Sedimentation: Sediment flows into streams from various human activities, covering eggs of some native fish and amphibians or making them more susceptible to infection, and potentially burying aquatic mollusks and freshwater mussels.

Approach: Reduce run-off of sediment from logging, agriculture, grazing, roads, urban and other activities that could disturb soil or destabilize streambanks. For example, work with Oregon Department of Agriculture to promote the implementation of area-wide water quality management plans under Senate Bill 1010 so that farmers and ranchers know which actions they can implement to address water quality problems in their watershed. Some of these strategies are terracing fields, filtering run-off before it enters aquatic systems, or installing sediment control basins to reduce erosion and practicing conservation tillage. Water quality credit trading programs to control sediment loads (and other pollutants) can help ensure good water quality levels. When constructing new roads, consider sediment removal capabilities in road design. Maintain and restore riparian and wetland vegetation to filter sediments.

Factor: Passage barriers: Fish and wildlife depend on natural flow regimes and substrates for migration, foraging, and hiding. Dams, road culverts, or log puncheons can alter or affect in-stream flow. The large dams on almost all of the Cascade rivers alter considerable amounts of the bottomland habitats, and impacts anadramous fish passage upstream and downstream. Misaligned culverts with the downstream end above the water level disconnect stream passage corridors and may force wildlife to cross roads where they are vulnerable to vehicles and predators. Under-sized or improperly sized culverts can alter the transport of sediment and wood creating an uneven distribution of habitat. These effects can degrade riparian habitat and impact riparian-associated fish and wildlife. Additionally, altered flow regimes can contribute to higher temperatures in some streams.

Approach: Where possible, work with landowners and agencies to restore natural flow conditions on streams impacted by barriers. Remove or replace culverts or other passage barriers with structures that mimic natural conditions as closely as possible (for example, open-bottom arch culverts). Determine potential effectiveness of providing passage around dams for fish and wildlife (amphibians, reptiles, mammals). Develop new habitat sites where possible. Eliminate passage barriers or improve passage at existing barriers to provide travel corridors for fish and wildlife.

Factor: Degraded riparian condition and loss of habitat complexity: Riparian vegetation often is lost as habitat is converted to other uses. Riparian habitat provides significant benefits to aquatic systems. For example, riparian vegetation maintains water

Habitat Diversity Leads to Species Diversity in the Klamath Basin

The Klamath Basin rests on an ecotone: different habitat types converge together, creating an environment where, over a long period of time, many unusual species may evolve and thrive. The drainage of the Klamath Basin has shifted over its geological history: it once drained into the Columbia River via the Snake River; then drained into the Great Basin to the east; and now drains to the south via the lower Klamath River. These dramatic shifts in drainage patterns created several distinct aquatic systems that isolated the fishes living in the basin. As a result, over a dozen unique fish species evolved in this environment. Some of these fish are found nowhere else in the world, including several found only in Oregon: the Klamath Lake sculpin, the slender sculpin, and four species of lamprey. Many of these endemic fishes are highly adapted to the shallow lakes and rivers of the Klamath, and adjusted to the wide variations in climate characteristic of the region. Moreover, the Klamath River and its tributaries once hosted the third largest salmon producing river system on the West Coast, and salmon still migrate in the river and its tributaries. Now, the Klamath basin also contains the southernmost bull trout population. The great variety of fishes is present today because of these extraordinary past geologic events.

quality by filtering nutrient runoff. Coarse woody debris associated with riparian habitat provides structure for shade, fish and wildlife hiding cover, bank stabilization, and breeding sites for some amphibians and invertebrates. In some areas, such as the Willamette Valley and Klamath Mountains, extensive riparian habitat historically occurred on oxbows and side channels but have since been converted to other uses. In other areas, such as the Northern Basin and Range, stream channel stability has been eroded. In the Willamette ecoregion, many river features (off-channel aquatic habitat, gravel bars, deep channel pools, etc.) have been lost as land uses have changed over time.

Photo © Steve Parrett, Oregon Water Trust

Approach: Use voluntary cooperative efforts and incentive programs to maintain and restore riparian habitats on private lands (i.e., Conservation Reserve Enhancement Program). Maintain riparian buffers and minimize impacts from road building on public lands. Maintain channel integrity and natural hydrology. Continue efforts to understand historical range of channel stability and function. Where possible, restore historic channel stability and connectivity to floodplains. Continue restoration projects promoting the placement of large woody debris. Minimize conversion of riparian vegetation and offset the loss of habitat through on-site restoration or long-term protection and management of remaining areas. Also, ensure that the rate of removal of riparian vegetation is not excessive so riparian vegetation can continue to provide shade, prevent erosion and preserve water quality. Where appropriate and compatible with existing land uses, permit beaver habitat usage to continue maintaining habitat complexity. Continue efforts, including Senate Bill 1010 planning, to mitigate for the effects of agricultural practices on riparian condition. See discussion on riparian habitats for more information.

Collaborative Conservation Project: Cattle rancher paid to conserve stream water for native salmonids

In 2003, the Oregon Progress Board reported that only 24 percent of streams had sufficient water to satisfy all uses throughout the entire year. Inadequate in-stream flows raise concerns among fish biologists that native salmonids and other aquatic organisms will be negatively affected. In addition, farmers and ranchers depend on local creeks and rivers for irrigation and face economic hardship when stream flows cannot support crop or livestock production.

Oregon's Crystal-Clear Waters: Waldo Lake and Crater Lake

Breathtaking clear blue waters in fresh mountain air await many visitors at Crater Lake and Waldo Lake each year. Ensconced by almost 20 miles of spectacular cliffs, Crater Lake is the deepest lake in the United States, reaching depths of up to 1,900 feet. Crater Lake is about 6,000 feet above sea level, and its waters cover approximately 20 square miles. At more than 5,000 feet elevation, Waldo Lake is similarly nestled among several miles of wilderness trails and peaks, reaching depths of up to 420 feet. Formed by melting glaciers, both lakes have exceptionally transparent water, with visibility up to 100 feet and outstanding water quality. Both lakes of these spectacular natural resources are nationally recognized for their exceptional characteristics. Both lakes face a few potential concerns about the effects of recreational use.

At about 100 years old, Crater Lake National Park is America's 5th oldest national park. A very well-established national park, about 90 percent of the area is managed primarily for wilderness. Visitors can enjoy spectacular views year-round, with camping and hiking at up to 8,000 feet, boat tours in the summer, and snowshoe hiking and cross country skiing in the winter. For more information about Crater Lake see: *www.nps.gov/crla*.

Waldo Lake is the second deepest and most clear lake in Oregon. Visitors can boat on the lake, and can camp and hike in the wilderness near the lake. In 1999 comprehensive strategies for monitoring and recreational planning at the lake were initiated, a process which identified several gaps in understanding recreational impacts at the lake. Two extensive surveys on recreation use and attitudes were undertaken to assess some of these gaps, as well as sediment sampling to determine potential effects of motorized boating at the lake. Management plans for the continued enjoyment of this natural resource are on-going. For more information about Waldo Lake see: *www.fs.fed.us/r6/willamette/manage/waldolake/*.

While water availability and allocation are on-going challenges in Oregon, one organization is striving to enhance stream flows by employing a market-based approach to reduce the amount of surface water landowners divert for irrigation. The Oregon Water Trust (OWT), a not-for-profit organization based in Portland, partners with willing farmers and ranchers throughout the state to enhance in-stream flows by offering them a suite of incentives to do just that.

For the past four years, Oregon Water Trust has leased water rights from Pat Voigt, a cattle rancher who owns property near Prairie City, Oregon. Standard Creek, a tributary to Dixie Creek, which feeds into the John Day River, runs through Voigt's property and irrigates pasture while providing his herd with drinking water. The creek is important spawning and rearing habitat for steelhead trout while downstream Dixie Creek hosts cutthroat trout. Inland stocks of steelhead east of the Cascades are listed by the state as sensitive, and mid-Columbia steelhead are federally listed as threatened. Oregon's only populations of westslope cutthroat are restricted to portions of the John Day Basin where habitat constraints have led to a contraction in the species distribution.

According to the terms of the agreement with OWT, Voigt temporarily shuts down his diversion of water from Standard Creek from July through September. In return OWT compensates him for the amount of water that he dedicates to in-stream use during this period, which is enough water to cover 348 acres up to a foot deep. The partnership between Voigt and OWT results in the protection of 3.5 miles of rearing habitat for steelhead and cutthroat trout in summer when water flows are seasonally low.

The John Day River and its tributaries such as Standard and Dixie Creeks are population strongholds for wild steelhead, serving as anchors for recovery efforts and a viable fishery. Decreased stream flows are just one of several factors limiting steelhead recovery in the John Day Basin. However, water reallocation agreements like the one brokered between OWT and Pat Voigt help to maintain favorable freshwater habitat for salmon and steelhead while meeting the financial needs of landowners.

Voigt, who is Chair of the Grant County Soil and Water Conservation District, expresses this view when he says "OWT has the right attitude and approach to make this agreement work. I am compensated well for leaving the water in the stream, and it lets me feel good about doing a part in the recovery of the steelhead."