HEALTHY NATIVE HABITATS

Goal: Habitats for native species are abundant and provide the natural processes necessary for self-sustaining populations.

This goal relates to two functions of native habitats. First, they are refuges for populations of native species. Second, they provide natural processes that support self-sustaining populations. Most natural habitat types have been drastically reduced in the Willamette River Basin, especially in the Valley. Some will be easier to restore and maintain than others. Given the small amount of native habitat remaining, it will be important to prioritize the most important areas for protection and restoration (Figure 8). In some cases, altered landscapes can play an important role in providing essential ecosystem processes that support nearby native habitats and species.

Clean, available water is the foundation for healthy native habitats. Floods create and renew sloughs, islands and back-channels; however, at the same time they destroy landowners' investments. They deliver nutrients and transport spawning gravel and other sediment. Of course, clean available water is crucial to sustain the basin's economy and high quality of life. But the water-habitat relationship is not a one-way street. Healthy functioning habitats help to produce clean ample water. Mature conifer forests hold and release water more slowly than cut-over land and younger stands (Wenger 1984). Streamside vegetation filters nutrients and keeps water cool. Wetlands and complex floodplains store this cool water. In summary, healthy native habitats and clean, ample water are co-dependent.

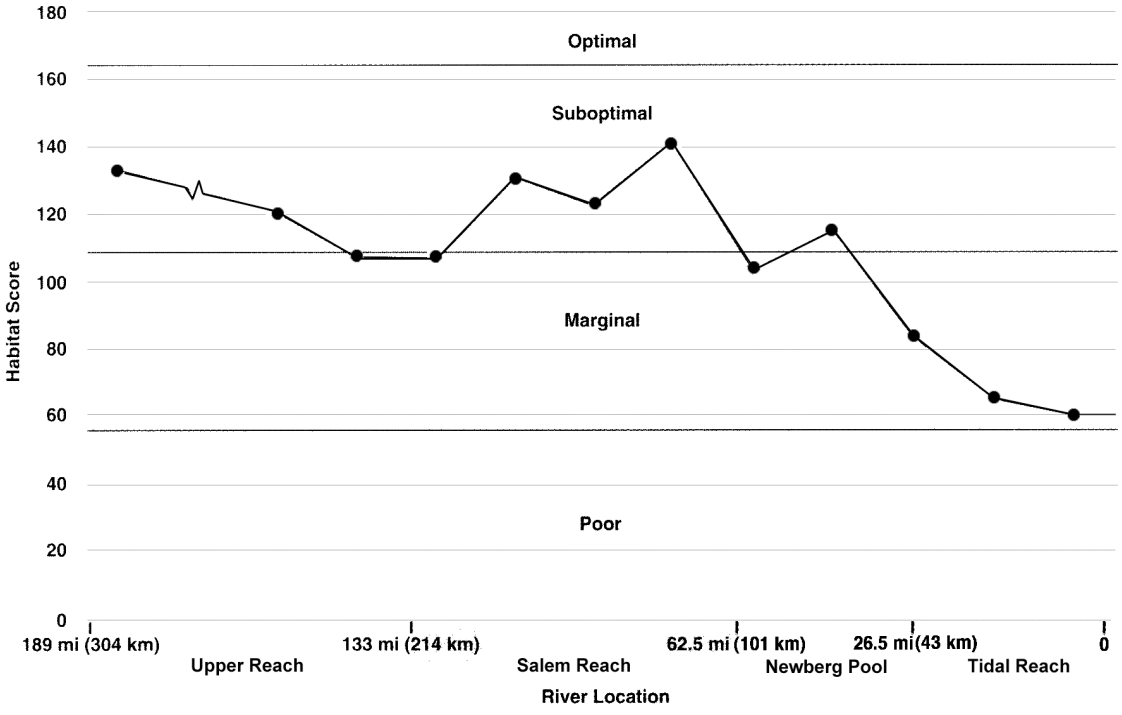


Figure 8: Habitat quality for the Willamette River. (Source: Leland et al. 1997)

As with water quality, there are big gaps in our knowledge concerning habitat conditions and restoration strategies. While we have a good idea of historic vegetation at a landscape level, we are in the dark regarding historic population levels of most native biota, and fundamental population dynamics of most of the 174 at-risk species in the valley. For example, we know the historic range of native salmonids fairly well, but historic numbers only go back to mid century. What were salmon abundances prior to mid-century dam construction? Furthermore, we have not always monitored salmon consistently through the years.

Much of the pre-settlement habitat in the Willamette Valley has been converted outright or significantly altered.

Habitats

- **Uplands**

Looking at the Willamette Basin as a whole, there is far more intact habitat in the Upland portion of the region than in the Willamette Valley. The Valley was settled first, while the Upper Basin was essentially held in reserve as US Forest Service (USFS) and Bureau of Land Management (BLM) lands for the first half of the 20th century. Timber harvest pushed upward in elevation from foothills to higher elevations from 1950 until the 1990s. Harvests on federal lands have dramatically decreased during the past decade as ecological and recreational attributes have gained more consideration. Mid-century forest practices allowed larger clear cuts and less stream protection, than present practices. Federal lands have more restrictive harvest practices, such as larger stream buffers, more protection for smaller streams, and smaller cut blocks. Oregon's Forest Practices Act does not provide the same level of ecosystem protection as federal guidelines, but protection has been increased over the past decade.

The Willamette's upland habitats and ecosystem processes are very different from those of the valley floor. Conifer forests on highly dissected slopes dominate the upper basin. While much of the original forest has been harvested, most of these forests are and will remain forested with a similar species mix rather than being converted to agriculture or residential use. The western Cascades hold a snowpack above 2000 feet from October to April, and the snowmelt provides cool, clean water for downstream biota and people. High gradient streams in the upper basin are a source of sediment and coarse woody debris, and they provide prime spawning grounds for salmon and trout (Macdonald 1999).

- **The Willamette Valley**

Habitats in the Willamette Valley can be classified into six major types: open water, bottomland forest, bottomland prairies, emergent wetlands, upland forests and foothill savanna/prairie. These habitats have been reduced or altered with the arrival of EuroAmericans in the Willamette Valley, the introduction of intensive agriculture, non-native species, and fire suppression.

Open water, i.e. instream, habitat has been progressively reduced since 1850. Open water habitat includes primary channels, secondary channels, tributary reaches, and sloughs, as well as ponds and oxbow lakes. Over half the tributary and slough reaches along the river were lost between

1850 and 1932. The Willamette *mainstem* can be divided into four major reaches based on channel characteristics: the more highly braided upper reach from Eugene to Corvallis, the slower-flowing, deeper, middle reach from Corvallis to Newberg, the slow moving Newberg pool behind Willamette falls, and the lower reach from the falls to the mouth. The greatest losses of open water habitat have occurred in the upper reach where there was more habitat to lose. Loss of tributary and slough habitat in the upper reach is estimated at 84 percent. Only 400 miles of fisheries habitat along the river, out of nearly 1400 miles of pre-settlement habitat, are left today.

Bottomland forest includes all forest and shrub-dominated riparian and wetland habitats. This type once covered some 350,848 acres or approximately ten percent of the valley. As of 1995, this habitat type had diminished to a coverage of some 98,924 acres, or 3 percent of the total basin area. Thus, an estimated 72 percent of bottomland forest has been lost due to conversion to agricultural, industrial, residential, travel corridor and other uses (Table 7). Remaining bottomland forests have been further altered by changes in flood regimes, ground water changes resulting from ditching or down-cutting of associated rivers and creeks, and invasion of non-native species such as Himalayan blackberry. Some 35 at-risk taxa, including northern red-legged frog, sharptail snake, bald eagle, and Townsend's big-eared bat, are found in this habitat type.

Bottomland prairies, estimated to have occupied 877,242 acres, or approximately 27 percent of the valley, originally included both wet and mesic (non-wetland) sedge- and grass-dominated habitats on the valley floor. At the time of European settlement, approximately one-third to one-half of the bottomland prairie type consisted of wet prairie; the remainder was mesic prairie. These mesic sites were very desirable for agricultural uses, and no remaining examples of this type remain. As of 1995, only about 4,900 acres of bottomland prairie were estimated to remain, a loss of 99 percent (Table 7)! This habitat type is home to some 36 at-risk species, including the Willamette daisy, painted turtle, northwestern pond turtle, and white-topped aster.

Emergent wetlands include marshes dominated by herbs and grasses, excluding the wet prairie type. Two plant associations within this habitat type, the Columbia sedge marsh and the Wapato marsh, are thought to be mostly restricted to the Willamette Valley. Emergent wetlands have historically occupied a very small part of the Willamette basin close to the mainstem. Emergent wetland vegetation is estimated to have originally covered only some 4,700 acres of the valley. As of 1995, this area had decreased to about 806 hectares total, a loss of about 58 percent (Table 7). Twenty-nine at-risk species, including Aleutian Canada goose, and a number of snails, mussels, insects, and plants, utilize emergent wetlands.

Upland forests occur primarily at the margins of the Willamette Valley and in interior areas protected from the frequent fires that were set throughout much of the valley. However, in other areas throughout the valley, an open woodland occurred, consisting of widely scattered Douglas fir, with an understory of hazel, vine maple, and other shrubs or dense stands of ferns, (probably bracken fern, *Pteridium aquilinum*). Post-settlement fire suppression, the resulting increase in tree regeneration, and logging have altered remaining woodland stands. This habitat type, originally estimated to cover some 362,132 acres, had decreased to an area of 47,564 acres by 1995, a loss of about 87 percent (Table 7). Some 31 at-risk species occupy upland forests in the Willamette Valley, including most of the sensitive mammal species, as well as the Cascade seep salamander, olive-sided flycatcher, and rare insects, ferns, lichens, and other plants.

Foothill Savanna/Prairie includes savannas dominated by widely spaced Oregon white oak, Douglas fir, ponderosa pine, or a mixture or one or more of these species, with an understory of native grasses and herbs. Over the last 150 years, the pre-settlement savanna/prairie mosaic has been almost completely lost. Nearly all sites from which fire has been excluded have been modified to closed-canopy woodland or forest. Originally covering some 1,701,540 acres, this savanna/prairie habitat type now occupies an estimated 206,269 acres, a loss of 88 percent (Table 7). This habitat type is used by 37 at-risk taxa, including Fenders blue butterfly and Kincaid's lupine, for which endangered and threatened status, respectively, have been proposed.

Table 7. Loss of major terrestrial Willamette Valley habitat types. (Source: Titus et al. 1996)

	Original Willamette Valley Coverage	**1995 Coverage**	**Percent Loss**
Bottomland Prairie	27%	>1%	99%
Foothill savanna/prairie	52%	6%	88%
Upland Forest	11%	1%	87%
Bottomland Forest	10%	3%	72%
Emergent Wetland	>1%	>1%	58%

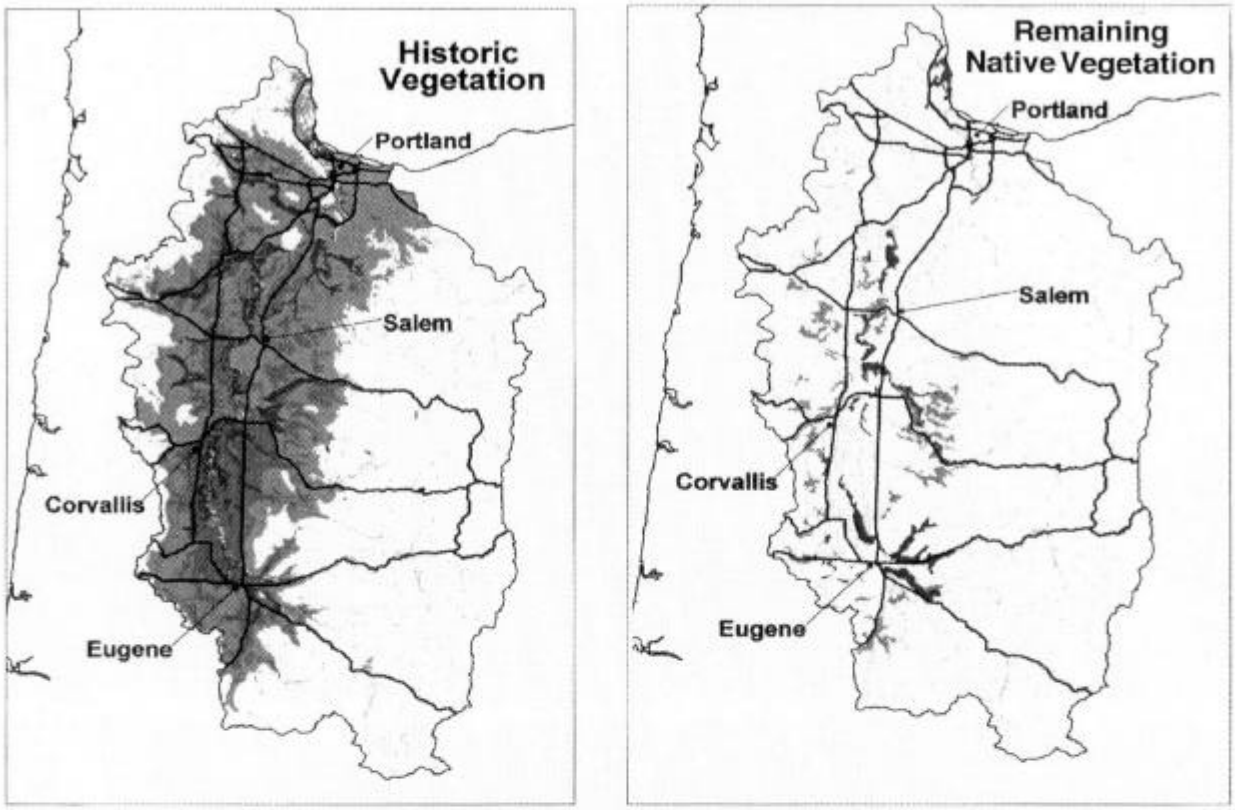
In summary, much of the original forest and savanna/prairie habitat has been converted outright, or has undergone a successional process in the absence of disturbance (Figure 9). These native habitats and the species that rely on them are rare. The likelihood of increasing the acreage of these habitats is low, as landowners have invested in alternative uses that can be quite profitable. Much of the bottomland prairie habitat is also gone. Bottomland forests and in-stream habitat have decreased and have been degraded, but much still remains.

Two other significant processes - the introduction of non-native species and fire suppression - deserve mention, as they have contributed substantially to habitat alteration and degradation in the Willamette Valley.

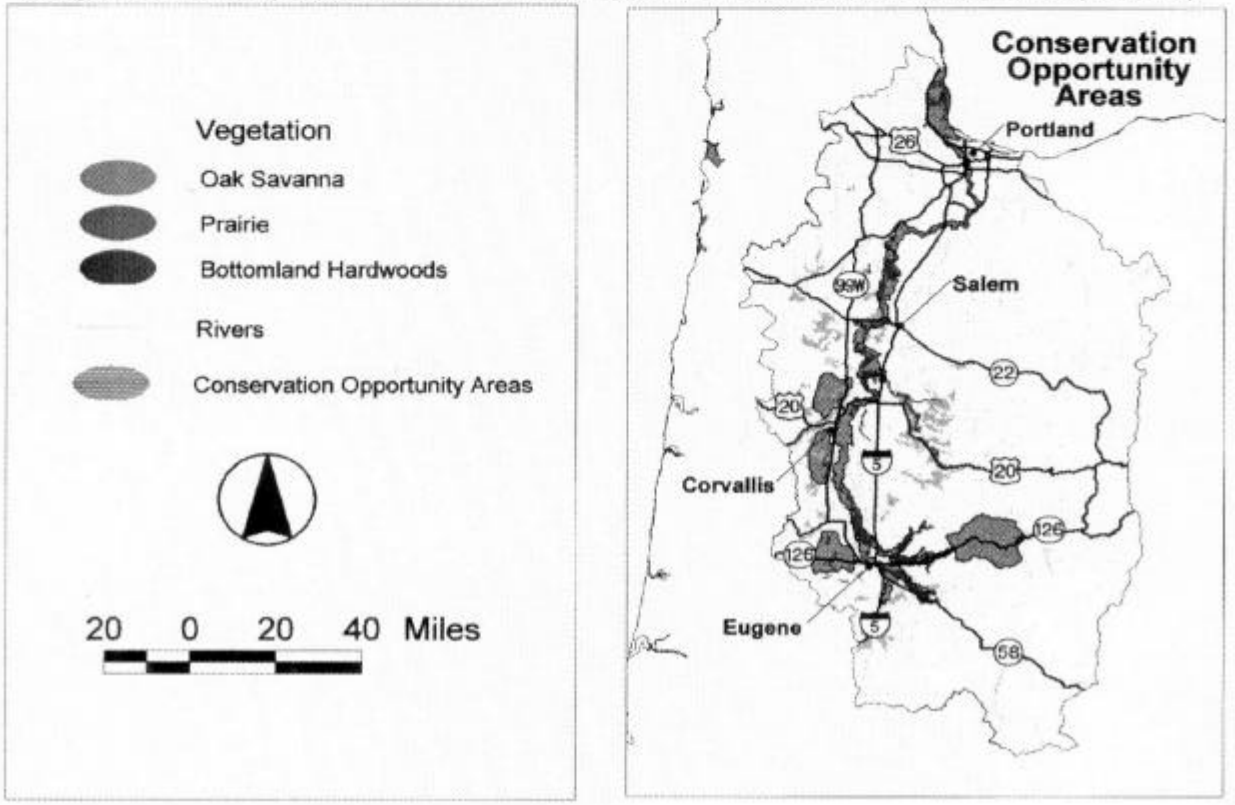
Non-native species: Non-native species have been intentionally introduced for agricultural or horticultural purposes or by accident in ship ballast, as seed contaminants, with livestock, etc. Non-native plant and animal species have replaced native species in many areas. Bullfrogs are impacting native fish and amphibian populations, and Scotch broom is threatening a number of sensitive prairie species such as Kincaid's lupine, Fender's blue butterfly and white rock larkspur. Non-native perennial grasses, especially reed canary grass, tall fescue, tall oatgrass, velvet grass, and orchard grass, invade native grasslands, changing their structure and crowding out natives. Nearly half the fish in the Willamette River are non-native, posing a significant threat to Oregon chub, bull trout and native amphibians.

Non-native plant and animal species threaten the health of native species and the integrity of basin ecosystems.

Figure 9. Comparison of historic (mid 19th Century) and remaining native vegetation in the Willamette Valley. (Source: Defenders of Wildlife, Oregon Biodiversity Project, 1999)



(Vegetation for the portion of the Willamette Basin that lies outside the valley is not pictured.)



Fire Suppression: The boundary between the valley's savannas and woodlands and the forests of the Coast and western Cascade ranges has shifted down in elevation since the 1800's. This shift is primarily the result of changes in one of the dominant disturbance regimes in the basin, fire. From about 2900 years ago until the 17th century, extensive fires were ignited by the Calapooia Indians in the late summer and early fall as part of their cultivation and collection of food plants and to assist with hunting. Annual burning kept seedlings of woody plants from establishing in open habitats such as prairie and savanna. Once European settlers suppressed fire, many prairies, savannas, and seasonal marshes were invaded by trees and shrubs, and converted to forest stands. Suppression of fires allowed many foothill woodland stands to become dominated by closed-canopy Douglas fir. However, in other areas increased frequency of fires converted conifer forests to deciduous forests and grasslands.

Wildlife

Aquatic habitat in the Willamette Basin is used by 44 (out of a total of 174) at-risk plants and animals, including Pacific salmon and steelhead, bull trout, Oregon chub, amphibians, turtles, mussels, bald eagles, and a number of rare insects, including dragonflies, damselflies, caddisfly, and aquatic beetles (Macdonald 1999). In this section, we summarize the condition of selected at-risk fish species that have, and will likely continue to drive species restoration goals in the basin. We also discuss these species because their life history requirements may address many of the ecosystem and habitat restoration issues in the Willamette River Basin. Our discussion is limited for these species, in part, because of space considerations. A more complete discussion of Willamette River Basin species can be found in Macdonald (1999) or ODFW (1997).

- **Bull Trout**

Bull trout in the Columbia River Basin (including the Willamette) were federally listed as threatened in June 1998. An inter-agency team is currently developing a recovery plan; the target date for completion of a draft plan is early spring, 2000.

In the Willamette River Basin, bull trout were historically found in the McKenzie, Middle Fork Willamette, Clackamas, and Santiam drainages; they presently are found only in the McKenzie River basin, in a population believed to be under 300 individuals. The habitat factors that led to the decline include impassable dams and culverts, which have helped eliminate some bull trout populations and fragment remaining populations. Other habitat factors include elevated water temperatures, excessive sedimentation, loss of pools and instream structure, and loss of side channel habitat, primarily due to timber harvest activities. Numerous management factors also contribute to the decline of bull trout in the Willamette, including overharvest by anglers in trout fisheries, chemical treatment (in the Middle Fork Willamette), competition and predation from introduced brook trout, and reduction in the abundance of salmon (a primary food source for bull trout).

For bull trout to recover, their population numbers must increase and additional populations must be established to create diverse groups of bull trout that can interact with each other. This will require maintaining and restoring the existing McKenzie River population, and evaluating the feasibility of re-introducing bull trout to historical areas.

Priority conservation actions for bull trout in the McKenzie River basin and re-introduction areas include addressing passage needs; maintaining and restoring critical habitat variables such as temperature, sedimentation, pools and side channels; continuing restrictive angling regulations; preventing additional introductions of non-native fish species; and increasing enforcement against illegal harvest (ODFW 1997).

- **Oregon Chub**

Oregon chub, a small minnow endemic to and once widely distributed in Willamette Valley floodplain habitats, now inhabits about two percent of its historical range. It was listed as endangered in 1993, and a recovery plan was approved in 1998 (USFWS 1998). Today, 24 populations (12 of which contain fewer than 100 individuals) exist in the Santiam, Middle Fork, Coast Fork, and several tributaries of the mainstem Willamette.

Oregon chub requires floodplain habitat such as slack water off-channel areas, beaver ponds, oxbows, side-channels, backwater sloughs, low-gradient tributaries, and flooded marshes. Such habitats, once prevalent in the Willamette Valley, have now disappeared. In addition to habitat modification and loss, factors for decline of Oregon chub include proliferation of non-native fish and amphibians; runoff from herbicide and pesticide applications; desiccation of habitats; unauthorized water withdrawals, diversions, or fill and removal activities; and sedimentation resulting from timber harvesting.

The Oregon chub recovery plan calls for establishing a sufficient number of secure, managed populations distributed throughout the Willamette Valley. The recovery program's first priority is to maintain the 24 existing populations; the second priority is to establish new populations through reintroductions and/or habitat enhancement to facilitate natural colonization in each of three subbasins: the Middle Fork Willamette, mainstem Willamette, and Santiam River. Recovery efforts will emphasize protecting, restoring and enhancing populations on public lands.

Priority conservation measures for existing and future Oregon chub habitats include: prevention of introduction or removal of non-native species when practical; prevention of inappropriate water diversions, fills or removals, water temperature change, excessive sedimentation or removal of cover; decreased pesticide and herbicide application and runoff; and restoration of floodplain habitats. Specific actions may include reducing logging-induced sedimentation, establishing buffer zones between agricultural land and Oregon chub habitat, and restricting chemical spraying. In addition, the Corps of Engineers has been asked to fund studies of the effects of hydropower project operations on Oregon chub populations, and to notify the Fish and Wildlife Service of any changes in operations that may affect Oregon chub habitat. The Oregon chub recovery plan is being cooperatively implemented by numerous state and federal agencies, as well as by key local stakeholders.

- **Spring Chinook**

On March 16 1999, the National Marine Fisheries Service (NMFS) listed the lower Columbia River Chinook salmon and the upper Willamette River Chinook salmon as threatened under the federal Endangered Species Act.

Once successfully spawning in an estimated eight regions above Willamette Falls, spring Chinook are now considered extinct in all but the McKenzie and Santiam Rivers. Spring Chinook counts made at Willamette Falls cannot be distinguished between wild and hatchery origins at this time. As a result, wild spring Chinook population trends are not precisely known. Wild populations are thought to be small and dominated by hatchery strays with the largest population suspected to be in the McKenzie River" (Kostow 1995). Current estimates of the abundance of naturally produced spring Chinook salmon indicate 3,900 natural spawners with about 2,600 of these being stray hatchery fish (Figure 10). Approximately 1,000 naturally produced spring Chinook salmon are thought to reside in the McKenzie River (Myers et al. 1998).

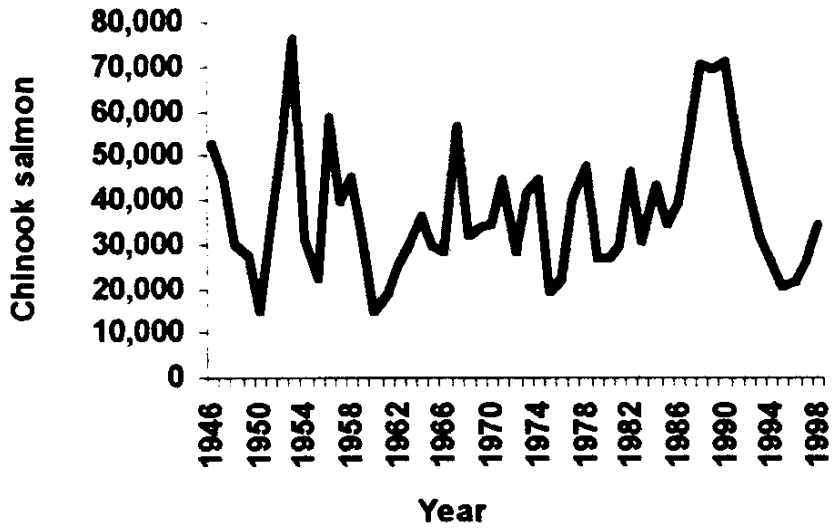


Figure 10: Total count (hatchery plus wild) of spring chinook passing Willamette Falls from 1946 to 1998. Wild fish counts were not segregated from hatchery counts until recently, thus, the true amount of wild salmon historically passing through these waterways is unknown. (Source: Patrick Frazier, ODFW)

The absence of summer migration in the Willamette River may be partially due to the loss of channel complexity in the mainstem below Eugene. This loss could have reduced the amount of rearing habitat for juvenile Chinook salmon below their spawning areas. In addition, rising river temperatures have been linked with increased susceptibility in fish to bacterial diseases naturally present in the river. These high temperatures may be exacerbated during the summer months resulting in increased mortality. As habitats continue to be fragmented and isolated in degraded watersheds, the summer life history of these fish is reduced or eliminated (Lichatowich 1999).

- **Winter Steelhead**

On March 16 1999, NMFS listed the upper Willamette River steelhead as threatened under the federal Endangered Species Act. The lower Columbia River steelhead was listed as threatened a year earlier.

Eight populations of winter steelhead in the upper Willamette River are currently listed, indicating an extensive distribution, in part due to recent steelhead introductions in streams draining the

coastal mountains. Indigenous steelhead in the basin occur within the upper limits of the Calapooia River. Approximately 60 percent of the wild winter steelhead in the Willamette are produced from the Santiam sub-basin. Previous studies suggest that Molalla River wild steelhead spawning peaked at 44 fish per mile in 1971 and reached a low of 7 fish per mile in 1993 (Chicolte 1998). The North Santiam maintained relatively stable steelhead populations until 1990, after which steelhead populations have been depressed. The South Santiam has experienced varying trends in different regions of the river, indicating both relatively stable populations and slowly declining groups. The Calapooia River experienced a period of increased abundance in the 1980s, prior to the very low levels documented in recent years.

The lower Willamette River steelhead populations (as monitored at North Fork Dam) demonstrate a period of large fluctuations (1961-1974), followed by a period of relative stability (1975-1990) and then a decline to very low levels (1990 to present).

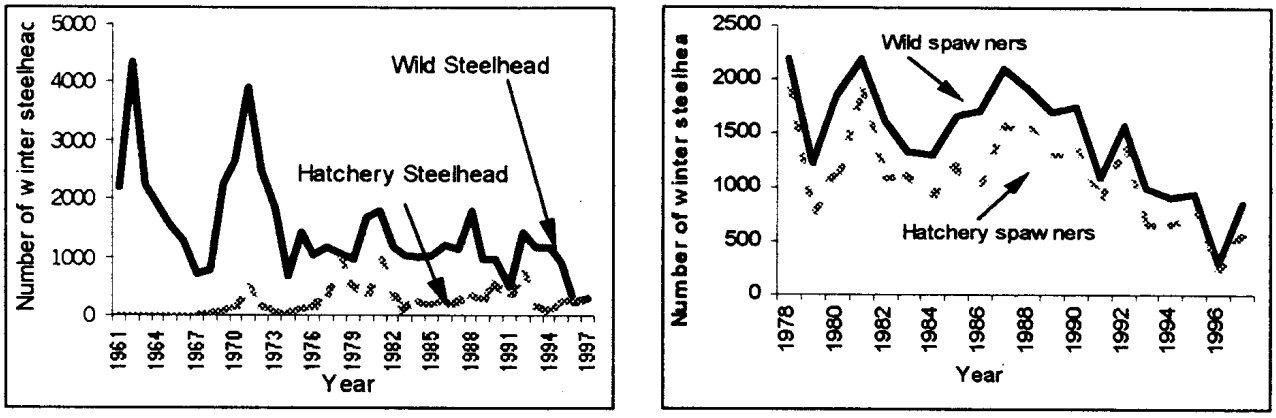


Figure 11: Wild and hatchery winter steelhead counted at the North Fork Dam on the Clackamas River from 1961 to 1997. (Source: Chilcote 1998)

An Approach to Salmon Restoration

The ubiquitous distribution of salmon in the basin brings them into contact with a wide range of human activities, many of which are economically viable. Salmon depletion is the result of various cumulative activities, and restoration efforts will require many changes in the way we manage watersheds and salmon and steelhead runs (Table 8). In particular, changes will need to be made in the following four categories: harvest, habitat, hatcheries and hydroelectricity (OBC 1996).

- **Harvest:** Pacific salmon throughout their range have been over-harvested. To maintain high harvest levels, in the face of deteriorating or lost habitat, managers have supplemented natural production with hatcheries. Managers have begun to set more conservative harvest targets, and to monitor both wild and hatchery fish, especially in areas containing natural spawning populations of salmon.
- **Habitat:** Salmon habitat in the Willamette River Basin has been eliminated by dams and severely degraded by land-use practices, as described in previous sections. Managers have begun to recognize that 1) it's most cost effective to protect habitat rather than restore it, and 2) restoration activities should assist the stream's natural healing processes.

Table 8. Scales at which human activities have impacted *Oncorhynchus* populations in the North Pacific region. (Source: adapted from Peterson and Parker 1998)

Human Activity	Impacts on Oncorhynchus populations	Spatial scale (general estimates)	Temporal Scale	Potential restoration activity
Agriculture	Local populations and metapopulations affected by sedimentation, loss of shading, introduction of pollutants	1-10^3 km along streams	Practices in place since late 1800s, affects aquatic habitat and health	Reduce sedimentation, promote revegetation and riparian buffers to trap pollutants from agricultural activities, change farming practices
Dams and hydrological alterations	Metapopulations affected by large dams; local populations affected by small dams	10-10^3 km along streams	Dams, in place since late 1800s, affect upstream and downstream migration	Modify water release to promote fish migration; remove dams
Fishing	Metapopulations and groups of metapopulations affected by reduced numbers of spawning adults	10^2-10^3 km along streams; up to 10^4 km2 in the ocean	Commercial fishing since mid-1800s; affects number of fish that can return upstream to reproduce	Reduce harvests spatially and temporally to allow stocks to recover; regulation varies greatly by species
Forest harvest	Local populations affected by damaged spawning habitat from sedimentation of streams	1-10 km, mostly along smaller streams	Since mid-1800s; affects reproductive phase of life cycle	Reduce forest harvest near streams; reduce sedimentation through different forest practices
Grazing	Local populations and metapopulations affected by sedimentation of streams, loss of shading, higher water temperature	1-10^3 km along streams	Since mid-1800s; affects reproductive phase of life cycle	Reduce grazing; restrict grazing in riparian areas; restore riparian vegetation
Urbanization	Local populations and metapopulations affected by altered water velocity, sedimentation and altered channel structure	1-10 km along streams	Since about 1900; affects all phases of life cycle	Improve flow retardation mechanisms adjacent to and downstream of urban areas
Fish hatcheries	Local populations and metapopulations affected by mixing native and nonnative genetic stocks; nonnatives may have lower fitness	1-10^3 km along streams, with additional impacts on ocean populations at larger scales	Since about 1900; affects all phases of life cycle	Favor restoration of native stocks over hatchery propagation; restrict harvest of native stocks

- **Hatcheries:** Hatchery programs, once touted as the cure all for depleted salmon populations, have not lived up to their potential. Hatchery production that merely replaces natural production is not a viable option for the basin. Decreased genetic diversity has been noted with respect to hatchery populations. Increased competition with wild runs and mixed stock fisheries are among the many negative impacts of hatcheries on wild fish (Stouder et al. 1997). For many rivers in the Pacific Northwest, hatcheries have not proven to be a good economic investment either (Radtke and Davis 1996). Performance measures need to account for the negative impact of hatchery operations on natural production.
- **Hydroelectricity:** Hydroelectric production and water use in general are the greatest source of conflict between the natural and industrial economies. Hydroelectric dams have had significant impacts on salmon populations, eliminating habitat, impeding runs, and altering temperatures. However, these dams also serve vital roles for the people and economy of the basin. Elimination and/or modification of these dams will prove difficult and expensive; the result may lead to more salmon habitat while also eliminating existing developed areas. Thus, modification of the hydrosystem must be based on scientifically sound experiments carried out in an adaptive format.

Life histories - the "sum of the important life functions such as spawning, incubation, rearing and migration" (Lichatowich 1999) - are the key to salmon restoration efforts. Each stage is critically linked to the next; habitat degradation encountered in one stage will thus necessarily affect fish health in subsequent stages. Martin (1998) has suggested a list of short-term strategies which may prove useful for both salmon and ecosystem restoration:

- Identify information gaps and initiate research to reduce those gaps.
- Obtain scientific peer review on key elements of the recovery program and on proposed research.
- Reduce harvest and predation.
- Develop an educational program.
- Reduce the negative effects of hatcheries.
- Take immediate actions to improve water quality and stream habitats.

Areas for Inquiry and Action

We can look at healthy native habitats through several lenses. For example, we can focus on individual species, on major habitat types, or on broad ecosystem processes. A landscape level view allows us to do all three. We can locate healthy populations and those in decline. We can map remaining habitat, and we can track ecosystem processes that affect species and habitats. We can also overlay society's past, present, and predicted development patterns and look for relationships between social, economic and natural patterns at a landscape-level (Zybach 1999). In fact, this is exactly what several initiatives are doing. Most notable at this time is the work of Hulse (1998) who is analyzing the landscape effects of three scenarios: rapid development, status quo development, and conservation-based development. The first of these scenario models is nearing completion with the latter two predicted to be complete in the next year. The authors suggest that a comprehensive conservation strategy should eventually connect components from floodplain, mid-elevation, and higher elevation habitats, recognizing that ecosystem processes and

species at mid and high elevations are already provided a reasonable level of protection by virtue of federal land management practices.

Even without these models we can recognize some obvious patterns and devise strategies based on these patterns (Figure 12). In the Willamette Valley, where nearly all land is privately owned, upland prairie/savanna is exceedingly rare, having been replaced by agriculture and to some degree by forestry and fire suppression. On the other hand, bottomland forests and wet prairies, important wildlife habitat and ecosystem regulators, are still present in some amount. Where do we focus our efforts?

Applying one common conservation strategy, "save the best and restore the rest," would likely mean near-term protection of existing bottomland forests and wet prairies, and any remnants of the rarer habitat types. Long-term goals might include the restoration of currently rare or extirpated habitat types, as well as looking for ways that all basin lands can provide services like clean water and near natural nutrient/pollution levels. The Oregon Biodiversity Project has taken ecological, economic, and social criteria into account in proposing key conservation areas for the Willamette Valley.

As multiple restoration and conservation efforts proceed, stakeholders should take advantage of opportunities for integrating these efforts. For example, the US Fish and Wildlife Service and the Environmental Protection Agency are exploring ways to integrate Clean Water Act processes such as TMDLs and Endangered Species Act processes such as Habitat Conservation Plans (Rea 1999). Further integration with state and local processes such as the Oregon Plan, Oregon's Forest Practices Act, Senate Bill 1010, and Metro's Title 3 can leverage resources and increase efficiency for government and private stakeholders.

Finally, as we consider the most effective means for restoring the Willamette, we might consider using the same "free" source of labor that created the numerous habitats and clean water in the first place: let the river do some of the work, it's cheaper. However, the river will need help doing its work. Considerable investments have been made in the floodplain, and the Willamette has been extensively modified to protect these investments. We can't simply rip out these modifications and let the Willamette run wild. We can, however, modify structures and alter management practices to restore part of the Willamette's natural function for key parts of the Valley.

Table 9 provides a summary of the key factors affecting habitat in the basin, as well as the key needs and possible strategies for addressing these factors.

Figure 12: Recommendations for a conservation strategy for the Willamette River Basin (Source: Presented to the Initiative by Hulse and Gregory June 1, 1999)

<u>Some thoughts on recommendations and a conservation strategy for the Willamette River Basin</u>
presented to the Willamette Restoration Initiative by Dave Hulse and Stan Gregory June 1, 1999

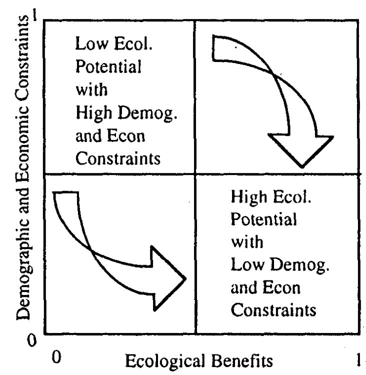
Where... (to take action)	What... (to conserve, preserve, restore)	How... (to geographically prioritize)	What... (to monitor)	When/Who?? (to take actions)
Lowlands (e.g. below 800' elevation)	1) Willamette River flows similar to historic range of variability 2) increased flood storage thru non-structural means 3) increased native floodplain forests and wet/dry prairie 4) reconcile increased urban densities with riparian setbacks in urban areas		every 5 years: 1) acres floodplain forest 2) acres wet/dry prairie 3) percent impervious cover in each urban growth boundary	
Midlands (e.g. 800' - 3000' elevation)	1) Oak, Ash, Douglas-Fir and Ponderosa Pine savanna 2) wet/dry prairie 3) native riparian forests	e.g.... 1) find all 1850 oak savanna 2) which are now: public — federal, state, county private — tailored menu of incentives, subsidies	every 5 years: 1) acres savanna 2) acres wet/dry prairie 3) percent stream miles with riparian forest by watershed	
Uplands (e.g. 3000' - 10,000' elevation)	1) conifer forest age structure and species mix closer to historic range of variability 2) native riparian forests 3) open habitats with high ecol. value	link upland reserves in public lands with key midland habitats clarify acceptable land and reservoir mgmt. practices in municipal water supply watersheds	every 5 years: 1) percent and pattern of watershed with old growth forest age class w/i natural range of variability 2) percent stream miles with riparian forest by watershed	

Table 9. Healthy Native Habitats Matrix

Goal	Setting	Needs	Possible Strategies
Habitats for native species are abundant and provide the natural processes necessary for self-sustaining populations.	• Upland, native habitats generally healthier than valley habitats and have several large conservation areas.	• Need to integrate management of upland and valley habitats to ensure regional conservation and restoration goals.	• Basin wide resource management coordination through the Initiative.
	• Significant reduction in instream habitat and channel complexity due to channelization and flow regulation.	• Need to increase channel complexity and restore side channels.	• Reconnect river floodplain in selected reaches through active restoration and flow diversification.
	• Floodplain, wetland and riparian habitats and reduced and upland habitats nearly eliminated.	• Need to protect remaining, healthy habitats. • Need for developed land to contribute to a healthy Willamette ecosystem network.	• Protect best riparian, wetland, and upland habitat through incentives, acquisition or regulation. • On intensively managed lands, explore options for habitat restoration or "ecosystem function" restoration through incentives, acquisition or regulation.
	• Reduced and altered habitats do not meet the life history needs of salmon and other aquatic species and terrestrial species.	• Need to match habitat functions with species life history requirements.	• Invest in basic research that connects specie's needs to ecosystem function and integrate findings into environmental planning.
	• Physical barriers to salmon migration, including dams, reduced available habitat and may kill salmon.	• Need to provide more habitat and easier passage for salmon.	• Identify key salmon migration barriers, prioritize and implement action for overcoming these barriers.
	• Non-native species threatening health of native species.	• Need to halt the introduction of non-native species which are threatening native species.	• Fund and implement federal, state and local invasive species eradication and control programs.

V. The Human Environment

The Willamette Restoration Initiative's goals for a strong economy, high quality of life, community stewardship, and accountable institutions need to be taken into account in addressing water quality and habitat issues. In doing so, the Initiative will have to address the following questions:

- How can we achieve water quality and habitat restoration goals and still have a strong economy?
- How can restoration efforts contribute to our quality of life?
- What are the tradeoffs?
- How can we support community stewardship and ensure an accountable institutional framework for strategy implementation?

The remainder of this paper seeks to help frame these issues by providing a sense of the challenges and opportunities that face us in our efforts to achieve the Initiative's multiple goals. More detailed assessment will be needed to fully understand the issues, opportunities, and constraints facing different sectors and communities throughout the basin. Here we seek to draw attention to key issues and options.

STRONG ECONOMY

Goal: A robust, diverse basin economy that draws continued strength from sustainable natural resource use and restoration strategies.

Economic development and environmental protection have long been seen as mutually exclusive. However, sustainable use of natural resources and restoration activities can contribute to the basin's economy in several ways. Markets can provide a powerful tool to support restoration efforts. Markets for sustainable agricultural products are growing rapidly, demand for certified forest products is exceeding supply, and consumers' preferences for "green" business practices in manufacturing, land development and retail are increasingly evident in the marketplace.

Healthy ecosystems also provide essential services such as water filtration and soil enhancement that can be of significant economic value to the region. Forest cover can help retain moisture and recycle nutrients in the soil, as well as regulating water flows (Myers 1997). Protected riparian buffers filter pollutants and nutrients from agricultural and residential runoff. The magnitude of economic benefits from watershed protection can be significant (Trust for Public Land 1999).

In addition, the environmental amenities in the Willamette basin attract companies and individuals to the region. Maintaining the quality of the basin's natural resource base will help ensure that the region remains uniquely attractive, contributing directly to long-term economic development opportunities. However, the projected in-migration of people and businesses in response to the region's environmental amenities increases the challenge of maintaining those amenities.

For restoration efforts to support a strong economy, the affordability of restoration alternatives must also be considered. In assessing affordability, the "total value" of any investment needs to be taken into account. Rather than relying on short-term, "least cost" options, total value reflects all costs and benefits, short- and long-term, direct and indirect, as well as *option* and *existence values*. The value of ecosystem services must also be included in assessing affordability.

Using incentives and other non-regulatory approaches to the extent possible can also help avoid the costs of regulation. A number of existing incentive programs can be used to support the adoption of new techniques. However, participation in these programs has been limited. Issues affecting participation include the time and effort required to establish eligibility, availability of supporting technical assistance, and the profitability of pollution control investments (Vickerman 1998).

There are many opportunities to build markets for environmentally friendly products and services, to tap into the wealth provided by intact ecological systems, and to develop affordable restoration options in developing a strategy for the basin. However, there will be tradeoffs. A Willamette restoration strategy will need to address the economic impacts of restoration efforts for each sector: agriculture, forestry, business, and urban. Land use may need to be modified in some areas. Industry may need to invest in new technologies to address environmental impacts. Municipal governments may need to alter their management practices.

One of the main challenges in balancing economic and ecological considerations is that the goals of economic development programs often conflict with other social and environmental goals. Recent collaboration between the Portland Development Commission and other city bureaus to integrate sustainability considerations into economic development efforts may help to link economic, social, and ecological objectives.

The Economic Setting

Today, approximately 69 percent of the population of Oregon -- over 2 million people -- reside in the Willamette Valley, with population expected to double in the next 50 years (USACE April 1999). A majority of this population resides in the urban centers of the basin. Land use in the basin is approximately 69 percent forestry, 33 percent agriculture, 11 percent mixed farm and forest, and 5 percent urban. The combined agricultural, forestry, and business activity in the basin constitutes nearly three-quarters of Oregon's economic output (WRI 1999).

Approximately 41 percent of the basin is publicly owned, primarily by the U.S. Forest Service (USFS) and U.S. Bureau of Land Management (BLM). Most of this land was traditionally used for timber production, although a recent shift toward ecosystem restoration has occurred as a result of the Pacific Northwest Forest Planning Act of 1994 (USACE April 1999).

Most of the land in the Willamette Valley is privately owned. Agricultural activity is diverse: the region's temperate climate and fertile soils are well suited to the production of high-value crops such as grass seed, Christmas trees, fruits, berries, nuts and vegetables (USACE April 1999). Processed canned and frozen food is produced here and shipped around the world, as well.

The concentration of population in the urban areas places significant pressure on resources in and around these areas. Economic activities in the basin's urban areas include industries such as manufacturing, retail trade, and professional and business related services. The universities in Corvallis and Eugene shape their local economies, as does state government in Salem. Portland serves as a major seaport for trade between the western United States and Pacific Rim countries, with exports totaling billions of dollars a year.

The character of the basin's economy poses a number of challenges. Unlike most of the land affected by the Northwest Forest Plan, many of the areas in the basin that are most critical for water quality and habitat investments are in private hands. The economic importance of Portland's port poses tough choices related to the impacts of dredging the harbor. Recent growth in the economy in and around the Portland area, combined with reductions in logging, fishing and other natural resource based economic activities, has widened the economic gap between rural and urban areas. This gap reinforces the need for an integrated strategy, based on strong rural-urban linkages and shared costs of restoration.

Specific restoration investments may differ throughout the basin. However, achieving restoration goals will require the engagement of every sector and every resident of the basin. Addressing water availability in particular will require a coordinated effort involving all basin residents in water conservation and management.

- **Agriculture**

The agricultural sector will be an important participant in restoration activities due to the extent of the effects of agricultural practices on erosion, habitat loss and water contamination from pesticides and fertilizers.

Priority issues for the agricultural community include
- **management of riparian zones for shade and erosion control;**
- **the adoption of practices that further reduce soil erosion and runoff; and**
- **reduction in pesticide and fertilizer use, and water conservation.**

In some cases, changes in management practices may be sufficient to mitigate agricultural impacts. In areas that are particularly critical for habitat or recreational uses, a variety of approaches can be used to support less intensive land use. Incentives can be used to encourage the use of "best management practices." For example, Senate Bill 791 authorizes qualifying private landowners to retain favorable tax treatment while managing their property for wildlife and habitat under a plan approved by the Oregon Department of Fish and Wildlife. Conservation easements and the Conservation Reserve Enhancement Program can also be used to support conservation practices in key areas. In some cases, the purchase of critical lands from willing owners may be a strategic investment of resources.

Many farmers are already making major investments in soil conservation measures and are using pesticides and fertilizers more efficiently. For many years, projects initiated under the 1954 Watershed Act have addressed flood prevention, water supply, drainage and irrigation, water quality, conservation, and fish and wildlife habitat protection in small watersheds. Soil and Water Conservation Districts (SWCDs) are providing support and guidance to farmers regarding agricultural practices that support restoration goals. These practices include erosion control, conservation tillage, and integrated pest management (IPM). These and other conservation practices are being integrated into the recent "1010 plans" that SWCDs and the Oregon Department of Agriculture are developing to address nonpoint source pollution from agricultural lands.

The cultivation of "eco-friendly" crops that require lower chemical inputs may be another way to reduce the use of chemicals while providing economic opportunities. Some of these crops -- which include flax, meadow foam, and wild rice, among others -- thrive in poorly drained riparian soils, and can provide a cover crop to reduce erosion between seasons. However, viable markets have yet to be developed for these crops. Using agricultural sites in or around state parks as demonstration sites for these crops may be one way to draw attention to these alternatives.

The potential for more widespread cultivation of "eco-friendly" crops will depend on a number of factors, including the development of adequate markets and processing facilities. Oregon State University extension agents, local conservation groups, the Oregon State Parks and Recreation Department, and interested farmers are working together on a more detailed assessment of opportunities and barriers for eco-friendly crop production.

Markets for sustainable agriculture can be a powerful force for change. Consumers and food companies are increasingly interested in food safety and are demanding wholesome products and production practices that are not detrimental to the environment (Schillhorn 1998; Kashmanian and Holtorf 1997). Although it still represents less than 2 percent of total food sales, the organic industry in the US has been growing at 24 percent annually for the past six years. Volume of organic sales is expected to reach $6.6 billion by 2000. In contrast, conventional food markets are growing at a only a few percentage points per year (Fried 1999).

Taking advantage of these markets may require some changes in management practices and skill development. Farmers that have been successful in tapping into these markets link their success to more intensive management, greater use of information about crop conditions, investments in marketing and purchasing expertise, and adoption of new technologies (Chambers and Eisgruber 1997). Extension services can do more to help farmers to access these markets by providing support for these types of investments. The use of "eco-labels" and other forms of brand promotion may also help create economic incentives for environmental management in agriculture (von Ravenswaay and Blend 1997). More market development may be needed for such programs to be effective.

Because the markets for organic and/or sustainable agriculture are still emerging, efforts to support more widespread application of these practices will need to address the economic uncertainties that farmers face in exploring new crops and modifying their management practices. Developing a coordinated approach that involves private sector efforts (e.g. The Food Alliance, Oregon Tilth), extension programs,

agricultural tax credits, and other financial mechanisms can help advance the adoption of agricultural practices that support restoration goals.

The Conservation Reserve Enhancement Program (CREP) could also be applied more effectively to support restoration efforts. CREP provides up-front payments to landowners in return for setting aside agricultural land in riparian areas for fifteen years. The program focuses on priority areas for fish recovery. However, there are a number of barriers to the effective use of this program, including limited technical assistance, exclusion of land in good condition or under particular types of crops, and price structure. The Initiative can help address the factors that limit the effectiveness of this and other programs.

Local Examples of Sustainable Success

Stahlbush Island Farm has increased profits through its investments in sustainable agriculture. Stahlbush Island Farms has adopted a number of conservation management practices, including crop rotation, cover crops, reducing and eliminating pesticides, protecting ground water, soil residue and product residue testing, and recycling and composting.

Stalhbush Island Farms generally produces and processes only crops for which specific customers have been identified. Farm managers and have integrated food processing with production to achieve greater market value (Chambers and Eisgruber 1997).

The Brick House Vineyards in Newberg is another successful agricultural enterprise relaying on sustainable production techniques. An organic vineyard established in 1990, Brick House participates in the Salmon Safe Program, which provides economic incentives to farmers and ranchers for conservation measures that improve salmon habitat. The management of Brick House believes that growing organically is desirable from the standpoint of grape quality and wine quality (Sustainable Northwest 1999).

- **Forestry**

The forest sector has already made significant progress toward reducing its environmental impacts. This is due, in part, to the drastic reduction in harvesting on federal lands in the region under the Northwest Forest Plan. In addition, recent changes in the Oregon Forest Practices Act have improved conditions along streams and emphasized other less damaging practices.

The most significant detrimental impact of forest management activities on water and habitat quality is erosion from logging roads constructed prior to the 1970s that relied on sidecast construction and inadequate drainage structures, and from roads that are not currently receiving adequate maintenance. There is evidence that run-off from logging roads may contribute to elevated peak flows; the widening of channels as a result of this run-off may also contribute to higher water temperatures.

Priority actions in forest management include:
- **closing and stabilizing poorly managed roads;**
- **upgrading roads where there is a high potential for erosion;**
- **modifying road drainage systems to reduce runoff;**
- **reconstructing stream crossings; and**
- **ensuring adequate vegetated riparian buffers for shading.**

A number of incentives can be used to support better forest stewardship practices, including conservation easements, tax reform, regulatory relief for best management practices, and education. Support for the decommissioning and improved maintenance of logging roads may require dedicated funding and technical assistance from both public and private sources. Decommissioning should focus on areas that have the highest potential for erosion.

Encouraging better resource stewardship among smaller private woodlot owners can be particularly challenging, as these small landowners often lack the time and resources to access technical assistance or other support programs. Direct financial assistance, marketing support, and more extensive education and technical assistance programs may be needed to reach these landowners (Vickerman 1998).

The growing markets for sustainably managed products may provide additional incentives for forest managers to adopt more environmentally responsible practices. Demand for certified timber products is still not widespread, but it is growing among retailers and other institutional purchasers.

The economic benefits of certification are still unclear. Certification can be costly, and to date consumers appear to be unwilling to pay a premium for certified products. However, the costs of certification may decrease as demand for certified product increases. Local municipalities and state and federal agencies can support growth in the markets for sustainably managed products through their procurement policies for forest and paper products. For example, the City of Portland is currently reviewing its purchasing policies and exploring ways to encourage the use of sustainable forest and paper products.

In some areas in the basin, effluent from forest product processing facilities such as pulp and paper mills contributes to higher water temperatures and contamination of waterways. Incentives can be used to support industry efforts to address these impacts. For example, tax credits can be applied to investments in pollution prevention or reduction. Technical assistance may be needed to help industries modify their current practices. In some cases, marketing assistance may help enterprises take advantage of "green" market opportunities related to their investments in environmental performance improvements.

Forest product processing enterprises may also capture economic benefits from environmental investments. For example, recent plant improvements at Collins Pine have saved the company over $1 million per year in waste management, energy costs, and water use (The Oregon Natural Step Network 1999a).

In summary, providing incentives to shift logging away from riparian zones on private forest lands and to support management of logging roads can help advance the basin's restoration efforts. Investing in sustainable forestry practices may add economic value to forest products in the basin while encouraging less environmentally damaging practices. The challenge to the forest sector is how to smooth the economic transition for displaced employees.

The Jobs in the Woods program, designed to retrain displaced forest industry employees in restoration skills, has had mixed success, in part because job opportunities in restoration have been limited. The "high skills" approach taken in some Jobs in the Woods Programs has faced some institutional barriers to

success. One of the main obstacles to realizing the potential of this program has been the difficulty of getting federal and state agencies to hire the more highly skilled workers, in part because they may be perceived to pose a threat to agency jobs (Brodsky 1998).

Approaches such as service agreements and stewardship contracting hold promise. These approaches provide for longer term, performance based contracts with local residents, helping to foster stewardship and contributing to the economic welfare of these communities. These programs have the potential to provide significant positive economic, social, and environmental benefits through more sustained work contracts, higher wages, and a better educated community. However, some federal and state agencies have been reluctant to implement these approaches, which shift more responsibility to contractors and reduce the role of agency staff (Brodsky 1998).

- **Business and Industry**

The diversity of commercial activities in the basin makes it difficult to summarize the impacts of commercial enterprises on water and habitat. Changing business practices to address impacts on water and habitat will likely require a combination of regulation, incentives, and education.

Priority issues for business and industry include
- **reducing water use;**
- **improving the quality of effluents; and**
- **moderating the use of toxic substances.**

In conducting their study on the impacts of the Endangered Species Act on the Portland community, the City Club of Portland identified a number of concerns among the business community. These included the uncertainty about impacts that regulations related to restoration goals may have on business practices, the difficulty of navigating conflicting goals and regulations, and the extent to which business may have to pass restoration costs on to their customers (City Club of Portland 1999).

In addition, riparian setbacks may result in lower efficiency and higher cost for real estate development and increase residential and commercial building costs. Storm water runoff regulations and increased sewage standards could increase the time and costs of the permitting process. Transportation costs may also increase for river-borne as well as ground transportation (City Club of Portland 1999).

These costs may be unavoidable if we are to achieve the goals of clean water and healthy habitats. A restoration strategy will need to explore how incentive programs, technical assistance, and other mechanisms can be used to ease the economic impacts of restoration efforts on business. For example, incentives can be provided through the tax system or by providing regulatory relief to companies that are proactive in addressing their environmental impacts on water and habitats.

Eco-Efficiency Benefits

Several local companies have benefited from pursuing more efficient resource use. By switching from petrochemical solvents to water-based solutions, Nike has eliminated the use of 1.3 million gallons of solvent annually, the equivalent of more than 30,000 barrels of oil. Estimates on overall raw-material cost savings are about $4.5 million annually –-this does not include savings related to labor, storage, or shipping (Oregon Natural Step Network 1999b).

The Fluke Corporation in Everett, Washington, a manufacturer of electronic test and measurement equipment, has realized significant cost savings from environmental investments as well. Prompted by a Superfund listing, the company shifted to on-site management of their hazardous wastes. This shift has resulted in considerable savings, as well as reducing the company's liability. Additional efforts to reduce water use has resulted in savings of over 24 million gallons between 1990 and 1996, with yearly savings of over $86,000 in purchase and treatment costs (Sustainable Northwest 1999).

A restoration strategy can also build on the growing voluntary engagement of the business community in environmental protection. Businesses accept environmental management responsibilities for many reasons. For example, in addressing pollution and resource issues, companies may see ways to reduce costs, obtain competitive advantages, improve customer satisfaction, add value to their products, forestall government regulation, meet public expectations about corporate citizenship, attract top-flight employees, and gain access to capital for expansion (Esty 1997).

Encouraging the use of *"eco-efficient"* technologies that provide both economic and ecological benefits can be a particularly affordable way to support restoration efforts. The benefits of adopting more efficient practices include reduced operating costs, improved profit margins, increased customer and employee loyalty, expanded market access, insulation from changing regulations, and increased competitive advantage (Friend 1999). Providing information about the benefits of investing in environmental performance improvement can be an important element of a restoration strategy.

The retail sector can also play an important role in addressing impacts on water and habitats by providing alternatives to toxic substances and a better selection of conservation-oriented products. Organicare and Environmental Building Supplies in Portland are just two examples of companies that have found a market for environmentally friendly products and services. Larger stores and chains also need to engage in developing responsible environmental practices, from the siting of their warehouses to the development and marketing of products that reduce harm to water and habitats.

Government agencies can lead by example. The City of Portland is encouraging businesses to adopt more efficient practices by integrating energy and other resource efficiency requirements into its building codes. Government agencies and other organizations can also use their purchasing and contracting policies to guide business investments toward less environmentally damaging practices.

Financial services provided by banks and other lending institutions can also be used to support development of more sustainable products and services. Shorebank Pacific, which is active in Portland as well as in rural areas of the region, explicitly directs its investments toward environmental performance improvements. Banking industry leaders are increasingly performing environmental due diligence when determining whether to extend credit lines or finance projects or equipment (Fried 1999).

- **Urban**

The urban communities in the basin are already active in addressing water quality and habitat issues. The City of Portland has conducted a study of the impact of city government activities on habitat and is developing strategies to address combined sewage overflow as well as development and construction impacts. Corvallis has invested significant resources in water treatment, and Eugene is working to coordinate planning across city agencies. The Urban Coordinating group that the Initiative has recently formed is already working to address a number of key urban issues, including the development of technical approaches and educational outreach.

Priority issues in urban areas include:

- **reducing amounts of suspended sediment from storm water runoff, sewage treatment facilities, and industrial sources;**
- **developing strategies to address the impacts of growth and development practices;**
- **addressing contamination in the Portland Harbor; and**
- **reducing water consumption and the use of toxics by urban residents.**

Addressing urban issues will probably require a mix of regulatory and incentive tools as well as broad based educational efforts. The sediment management plan developed for the Port of Portland reflects such a combination of regulatory and non-regulatory approaches. Educating urban residents, businesses, and government agencies about the importance of water conservation will be particularly critical because behavioral changes will be needed at the household level to address impacts on water supply, water quality and erosion.

Investments to achieve the goals related to water quality and habitat health are likely to have a number of tangible economic impacts on city residents, including:

- increased water and sewage bills
- limitations on water use
- restrictions on chemicals used in the home or yard
- new riparian protection measures
- increased time and cost for development processes
- impacts on land, homes, sprawl and livability
- increased costs of transportation infrastructure (City Club of Portland 1999).

While some of these costs may be unavoidable, in some cases incentives can be used to ease their impacts. Incentives might include regulatory relief or fast tracking permits for businesses that adopt environmental performance systems. Technical assistance could be provided for individuals or enterprises willing to adopt less harmful practices. Supporting water and energy conservation also provide

affordable ways to address restoration goals. The City of Portland is currently exploring ways to modify water and sewer rates to encourage water conservation.

Construction and development practices have some of the most significant impacts on water and habitat in urban areas. Revising city codes is one of the most powerful tools that governments have to address these impacts.

Construction Impacts The City of Portland's Energy Office has recently completed a "Green Building Options Study" that explores how the city can promote resource efficient and healthy building practices. Green" building techniques incorporate energy efficiency, water conservation, waste minimization, pollution prevention, resource-efficient materials, and indoor air quality considerations in all phases of a building's life. Side benefits of "green" approaches to construction include the creation of additional jobs to handle the removal, processing, and marketing of used building materials (Sustainable Northwest 1999). The reduction of toxins in the built environment also has positive health benefits.

Although reducing negative environmental impacts is one motivation for adopting green building practices, economic savings are a major consideration as well. While up-front capital costs for "green" building construction may at times be greater than standard construction costs, the long-term operating costs are often significantly lower. Adequate financing options are needed to support these longer-term returns on investment.

Efforts to support green building are underway in other municipalities in the basin as well. Green Builder in Corvallis provides support and project management services for sustainable building projects. Green Builder has worked with a number of corporations and agencies, including the Oregon Housing and Community Services Department, the Marion County Department of Solid Waste, and Hewlett-Packard (Sustainable Northwest 1999).

Development Impacts Overall development siting is another critical issue. The current land use planning framework directs development toward riparian zones and other sensitive areas such as steep slopes. To help address these issues, Metro's Title 3 program focuses explicitly on floodplain conservation and water quality protection. The City of Portland's Office of Planning and Development Review has also initiated both an environmental zoning program and a Willamette Greenway zoning program.

The environmental zoning program encourages flexibility and innovation in site planning and provides for development that is designed to be sensitive to environmental resources. The Willamette Greenway zoning conserves, protects, and enhances the natural, scenic, historical, economic and recreational qualities of lands along Portland waterways. This program also improves public access to the river and establishes clear standards and criteria for development along the river. The success of these programs will depend upon adequate staff resources for enforcement of regulations and monitoring of permitted development (USACE June 1999).

While the impacts of restoration efforts may be burdensome in the short term, urban areas may enjoy longer term benefits from addressing development impacts on water and habitats. Restoration of fish populations in urban streams and the possibility of restoring a healthy urban sport fishery can enhance the role of urban areas as eco-tourism destinations. The establishment of additional streamside parks in urban areas can expand both recreational and habitat opportunities. These efforts may also enhance the

basin's image as a region dedicated to a healthy environment, providing a powerful tool to attract new businesses and residents interested in enjoying and maintaining a high quality of life (City Club of Portland 1999).

In addressing urban restoration issues, some of the most promising strategies involve public education and the opportunity for government to lead by example. Fostering a network of urban communities throughout the basin can provide opportunities for these communities to learn from each other.

Table 10. Strong Economy Matrix

Goal	Setting	Needs	Possible Strategies
A robust, diverse basin economy that draws continued strength from sustainable natural resource use and restoration strategies	• Economic development and environmental protection are often considered to be mutually exclusive.	• Need to explore how markets can be used to support restoration efforts. • Need to gather and disseminate information about eco-efficient alternatives.	• Support the development and implementation of practices that have both economic and ecological gains through extension, education, and incentives.
	• Investments will be required that will have economic impacts on some sectors, individuals, and enterprises.	• Need to ensure that restoration efforts are affordable and that costs are mitigated to extent possible.	• Government agencies can provide technical assistance, incentives, and other assistance to mitigate costs of restoration. Incentives can be particularly powerful tools.
	• The movement away from a resource-based economy has already stressed communities that have traditionally relied on the resource base.	• Rural communities need more diverse economic opportunities that can support restoration goals.	• Integrate economic development strategies with restoration efforts.
	• Lack of effective incentives to support restoration efforts.	• Incentive programs need to be expanded, and existing incentive programs need to be modified for easier implementation.	• Assess existing incentive programs to ensure they support restoration goals. • Expand incentive programs where needed.
	• Many stakeholders are unfamiliar with economic alternatives that are environmentally friendly.	• Sectors need more information about options and support programs.	• Engage extension programs and other networks to gather and disseminate information about options for each sector.
	• Although many activities are already underway to to address impacts on water quality and habitat issues, they are not well coordinated. This may result in wasted resources.	• Need coordination among existing efforts (USACE studies, "1010" plans, etc).	• Build strategy around existing efforts whenever possible

QUALITY OF LIFE

Goal: Basin residents have the opportunity for frequent interaction with healthy streams and natural settings in urban, rural, agricultural, and forest lands.

"Quality of life" and "livability" are two terms that are frequently used to describe the unique characteristics of life in the Willamette basin. In Choices for the Future, the Willamette Livability Forum (WLF) offers a compelling description of the elements that make up the valley's high quality of life, including land use, water/environment, transportation, community, economy, and decision-making (WLF 1999). The characteristics that valley residents value the most include clean air and water, preservation of open space and natural resources, and livable communities. These attributes are echoed in the list of "top concerns" that the Livability Forum identified, which include overpopulation, loss of open space and natural areas, and traffic.

Maintaining the region's quality of life in the face of expected population growth is one of the region's biggest challenges and greatest opportunities.

A number of surveys have documented the high value that local residents place on the survival of salmon and other species (OBC 1993; Elway Research 1995). The cultures and traditions of Native American tribes emphasize the central role of salmonid species in their heritage. These less tangible but extremely important values deserve due consideration in developing a restoration strategy.

The natural amenities of the valley, the proactive efforts in planning and resource management to date, and the commitment of the population to preserving the region's livability provide a unique opportunity to create and sustain one of the most vibrant, livable communities in the nation. The value that residents place on open space, fish and wildlife habitat, and a healthy environment can provide the political will to invest in maintaining and enhancing these elements of livability.

Ironically, present and future efforts to enhance livability in the valley will continue to attract more new residents to the region. Addressing how growth will happen is therefore the critical issue.

A number of organizations, including the Willamette Livability Forum, Livable Oregon, 1000 Friends of Oregon, and others are working to ensure that "livability" and "quality of life" in the basin receive the attention they deserve at the policy and community level. The Oregon Progress Board's State of the Environment initiative also supports these efforts. A restoration strategy should build on these efforts to contribute most effectively to an integrated regional effort.

One of the most critical obstacles to growth management is that local governments lack the capacity for environmental planning and integrated resource management. State and federal government can provide technical and financial support to local communities to assist in these efforts. Existing programs that provide support to local communities may need to be reassessed to ensure that their goals are consistent with restoration objectives.

Recreational Access

The Initiative's vision that basin residents will "have the opportunity for frequent interaction with healthy streams and natural settings in urban, rural, agricultural, and forest lands" focuses particular attention on the contribution of outdoor recreational opportunities to quality of life in the region. The value that basin residents place on outdoor recreational opportunities has been documented in a number of surveys (OBC 1993).

Recreation planning in Oregon already takes into account the changing social and economic landscape in the state to ensure that there is an "equity of opportunity" for recreational options in Oregon (Oregon Parks and Recreation Department 1994). The Oregon Parks and Recreation Department has identified thirteen strategies to meet the outdoor recreation needs of the growing population, ensure a variety of high quality outdoor recreational opportunities, and contribute to public stewardship of natural, cultural and scenic resources (Oregon Parks and Recreation Department, 1999, April 3 memo to WRI). Selected strategies include:

- identifying the needs and opportunities for connecting public open space lands and providing additional land for recreation, resource protection and enhancement;
- identifying opportunities for restoring riparian and floodplain functions on public park and open space lands;
- managing recreational uses in ways compatible with riparian and floodplain functions and river restoration objectives;
- increasing public information about recreational opportunities, natural resources and processes; and
- managing agricultural leases to meet objectives for recreational use, resource management.

The link between quality of life and economic opportunities is particularly evident with regard to outdoor recreational opportunities. Non-resident outdoor visits to the Willamette Valley region have been estimated at 6.9 million per year, with total expenditures of $202.6 million. These activities supported over 7,000 jobs and generated $175.9 million in employee compensation and proprietary income (Johnson et al. 1995). Opportunities for sport fishing also contribute significantly to the regional economy. In 1996, sport fishing in Oregon provided an economic output of more than $1 billion, supporting almost 15,000 jobs, and generating more than $16 million in state taxes (Maharaj, date unknown). Tourism-related businesses, such as retail trade, restaurants, and lodging places are those most directly affected by these investments, but the indirect effects of outdoor recreational expenditures on other industries in the region are significant as well (Johnson et al. 1995).

However, providing recreational access to the region's natural resources faces a number of challenges. Lack of funding for management of the 93 sites along the Willamette River that are owned by the Parks and Recreation Department has prevented development of many of these sites for recreational purposes. The concept of a Willamette Greenway has received widespread popular support but limited financial commitment.

Another challenge to achieving this goal will be balancing recreational opportunities with the impacts that recreational use can have on the natural resource base. Popular swimming holes may also serve as refuges for fish on hot days. Providing more access to the river by developing more state park sites may require the development of infrastructure, such as parking lots and other facilities, that can negatively impact the river. On the other hand, maintaining adequate riparian buffers for erosion control may limit access in some areas while reducing impacts on the river.

Reservoir management also faces significant challenges in balancing recreational and other water uses. For example, draw-downs to address flow levels, water quality issues, and fish habitat considerations often generate vocal opposition from recreational users of the reservoirs. More extensive educational outreach to local communities regarding the water quality and habitat considerations in reservoir management may be one way to help ease these tensions.

A growing population will increase the pressures on the basin's rivers and other recreational resources. Portland's Vision 2050 emphasizes the river as the center of the community, with increased access as a central element of this vision. The Willamette and its tributaries are central to daily life in Corvallis and Eugene. The community of Milwaukie is also exploring ways to increase access to the river. It will be all too easy for us to "love the river to death."

A restoration strategy will need to address how access to the basin's rivers and other areas for recreational purposes can be managed in an equitable and ecologically responsible manner. Tradeoffs need to be addressed systematically and strategically, so that the best use of every area is achieved. The strategies proposed by the Parks and Recreation Department provide a good starting point.

Table 11. Quality of Life Matrix

Goal	Setting	Needs	Possible Strategies
Basin residents have the opportunity for frequent interaction with healthy streams and natural settings in urban, rural, agricultural, and forest lands	• Basin residents place a high value on livability, a healthy environment, and the continued existence of species such as salmon. • Projected population growth will increase pressure on the region's quality of life, including recreational resources.	• Livability issues such as growth management will require a concentrated, coordinated effort at all scales to direct development toward appropriate areas.	• Develop a strategic framework for growth management at all levels.
	• Local communities lack resources for integrated environmental planning.	• Technical and financial support, including incentives, are needed to assist local communities in planning and management.	• Ensure state and federal support for local communities is consistent with restoration goals.
	• Access to outdoor recreational opportunities is important to valley residents.	• Adequate access to recreational opportunities requires strategic planning and adequate funding.	• Ensure adequate support for development of recreational resources.
	• There are tradeoffs in some cases between allowing access for recreation and protecting key habitats.	• Recreational access needs to be balanced with impacts on habitat and water quality.	• Establish a clear strategy for development of recreational sites that will reduce or minimize impacts on habitat and water quality.
	• Recreational resource users often oppose management for other purposes.	• The public needs to understand why access needs to be restricted in some areas or at some times.	• Educate public about the strategy to build understanding and gain support where restrictions will be needed.