Photo © Bruce Newhouse

Strategy Habitat: Riparian Habitats

Characteristics:

Riparian habitats are those adjacent to rivers and streams or occurring on nearby floodplains and terraces. Riparian habitats are shaped and maintained through seasonal flooding, scour, and soil deposition. Floods replenish nutrients, recharge groundwater, and reset successional processes. Riparian habitats occur along rivers and streams at all elevations, from valley bottom floodplains to alpine torrents. Riparian habitats also include springs, seeps, and intermittent streams, and many low elevation alluvial floodplains confined by valleys and inlet.

Riparian habitats vary from sparsely vegetated areas to cottonwood gallery forests due to flood dynamics. Plant composition is influenced by elevation, stream gradient, floodplain width, and flooding events. Throughout most of the state, riparian vegetation is mostly dominated by deciduous trees and shrubs, such as bigleaf maple, alders, aspen, cottonwood, dogwood, willows and Oregon white ash. Conifers, such as pines and spruce, dominate some riparian woodlands at higher elevations. Riparian habitats in the Blue Mountains ecoregion are the most variable in Oregon, influenced by elevation and precipitation. In some ecoregions, riparian habitats include some riparian shrublands. In the East Cascades, riparian shrublands are dominated by deciduous shrubs, such as willows, creek dogwood, western birch or hawthorn. Shrub thickets in the Northern Basin are dominated by deciduous shrubs, such as several species of willow, birch, alder, and chokecherry. Riparian meadows are also found in the Northern Basin and Range and are dominated by grasses, sedges and rushes.

Conservation Overview:

Riparian habitats often have high species diversity and are critical for wildlife. These habitats are important to species that prefer moist shrubby or forested habitats. Riparian areas provide essential wintering habitat and travel corridors for songbirds, mountain quail, white-tailed deer, and other wildlife. In arid areas such as the Blue Mountains and Columbia Plateau, riparian habitats can provide abundant insects, plants, and moisture throughout the year. Riparian meadows include natural spring-seep habitats that are extremely important for a wide variety of species, including greater sage-grouse chicks and butterflies.

In addition to providing habitat for birds and other wildlife, riparian habitats have important ecological functions. Healthy riparian vegetation protects banks from erosion, influences in-channel aquatic habitats, maintains favorable water temperature for fish through shading, filters runoff, and provides nutrients. Riparian vegetation creates meanders and increases habitat complexity in valley bottoms. In the Northern Basin and Range ecoregion, riparian vegetation can protect against scour from summer storms. Riparian habitats link upland and aquatic habitats. Upland habitats have a critical role in watershed function and affect riparian and aquatic habitats, particularly in drier, low-elevation sites.

Riparian habitats have declined from historic levels and are now greatly reduced in area and connectivity, especially those in low-elevation areas and valley bottoms. Development, logging, road building, agriculture and pasture use have degraded some riparian habitat directly through decreased riparian vegetation, increased sedimentation, and reduced large wood in streams. Runoff containing fertilizers and other contaminants can further impact habitat.

However, steps have been taken through Oregon's planning and regulatory framework to address some of these issues. Cooperative restoration projects have benefited riparian-dependent species on forest and agricultural lands. In many cases, these efforts have focused on improving habitat quality in smaller, fish bearing streams. Streamside buffers implemented through the Northwest Forest Plan on public land and the Oregon Forest Practices Act on private land have improved riparian health on both public and private lands. On agricultural lands, Agricultural Water Quality Management Area Plans and Rules have been adopted across the state to address riparian conditions and other water

quality issues. While each riparian rule is slightly different depending on the local area, the riparian rules generally require agricultural activities to allow establishment, development, and maintenance of riparian vegetation consistent with site capability to provide moderation of solar heating, filtration of overland flow, and streambank stability. The State expects to see improvements in riparian conditions on agricultural lands in the future and has initiated a riparian land condition monitoring program to track changes in riparian conditions over time. Riparian areas across the state will likely be conserved by a variety of measures including a combination of existing state and federal programs, both regulatory and nonregulatory. This will control degradation and improve water quality. Oregon Department of Environmental Quality's completion of Total Maximum Daily Loads will also bring more specificity to recovery processes. For urban and rural residential development, some guidelines are provided through local land use ordinances adopted to address Statewide Planning Goal 5 requirements for riparian vegetation.

Riparian habitats can be difficult to map and study over time, presenting challenges for understanding their conservation. Of all the ecoregions, Klamath Mountains has the least sampled and least understood riparian habitats and more information is needed on their composition, ecology, and management.

In addition to these general conservation issues, there are several ecoregion-specific issues that affect riparian habitats:

- **Willamette Valley:** riparian forests have significantly declined with increasing development. Many streams now have only a thin strip of riparian vegetation, and some have none. Despite increasing emphasis on protection of riparian habitats and the formal establishment of the Willamette River Greenway, riparian habitats continue to decline.
- **Coast Range, Klamath Mountains, and West Cascades:** Historically, development, logging, road-building, and agricultural practices have all impacted riparian areas in these ecoregions and continue to have some impacts, particularly at lower elevations. Development threatens riparian habitats in these ecoregions because high quality riparian habitat is also often perceived as desirable sites for residential development. Creation of dams and reservoirs has impacted riparian habitats in the West Cascades. Streamside buffers implemented through the Northwest Forest Plan on public land and the Oregon Forest Practices Act on private land have improved forestland riparian health in the last 15 years.
- **Northern Basin and Range:** Riparian habitats have been heavily impacted by habitat conversion, unmanaged grazing, invasive species and alterations in hydrology such as water withdrawals and channelization. Historically, beavers played a key role in creating wetlands and riparian areas, but beaver populations have declined. Construction of flood control dams, channelization of stream courses, and increased stream withdrawals for irrigation and other uses caused further riparian loss and degradation. Juniper is encroaching in some riparian habitats, affecting hydrology.

Limiting factors to Riparian habitats:

Factor: Loss of riparian habitat, floodplain function, and habitat complexity: A high percentage of low-elevation and valley bottom riparian habitats have been lost. Riparian vegetation often is lost as habitat is converted to other uses. In several areas around the state, large cottonwood trees and gallery forest have been lost due to clearing and altered hydrological regimes. Development can restrict the natural ability of streams and riparian habitats to meander over time, limiting these habitats. Floodplains have been converted to other uses. Excessive removal of riparian vegetation can cause sedimentation that damages aquatic areas, loss of habitat complexity, and increased water temperatures that adversely affect aquatic habitat. Loss of streamside vegetation leads to bank erosion. Grazing and dam construction can degrade riparian habitats. Urban development has led to stream channelization and vegetation loss in some areas.

Approach: Restore riparian zones that will provide the full array of associated ecological functions. Use voluntary cooperative efforts (i.e., Conservation Reserve Enhancement Program) and incentive programs to conserve, maintain and restore riparian habitats on private lands. Identify and apply lessons learned from successful riparian restoration efforts on private lands to future projects. Develop tools and financial incentives to assist with streambank stabilization and decrease downstream soil movement. Improvements in riparian habitats and hydrology can also improve the quality of remaining wetland habitats. Maintain and restore riparian buffers and minimize impacts from road building on public lands. Where appropriate, permit beaver habitat usage to continue maintaining habitat complexity, particularly in the Coast Range and parts of eastern Oregon. Maintain channel integrity and natural hydrology. Where feasible, work to restore historic hydrological conditions. Ensure that adequate riparian vegetation remains following management activities, so riparian vegetation can continue to prevent erosion, preserve water quality, and promote water temperatures favorable for fish. Restore lost vegetation through planting of native trees, shrubs and ground cover. Manage for future sources of

large woody debris. Maintain and/or expand existing tracts of cottonwood forest and all cottonwood trees greater than 20 inches diameter regardless of landscape context.

Factor: Habitat degradation: In the Blue Mountains, Northern Basin and Range, East Cascades, and Columbia Plateau ecoregions, historic overgrazing has led to soil erosion, poor regeneration of hardwood trees and shrubs, changes in plant species composition and structure, and degradation by invasive plants. Although some areas are slowly recovering, many miles of stream are still lacking riparian vegetation. On-going grazing impacts remain in some areas, especially at low and mid-elevations. Western juniper is encroaching in some riparian areas of eastern Oregon.

Approach: In cooperation with landowners, land managers, and grazing leasees, encourage approaches that keep livestock out of riparian areas such as off-site watering. Develop and implement grazing regimes that are compatible with riparian conservation objectives. Selectively fence restoration sites or other high priority areas to exclude ungulates at least until riparian vegetation recovers. Evaluate impacts by encroaching western juniper, and remove juniper from upper reaches of higher elevation watersheds, if site-appropriate. Plant riparian vegetation at priority sites, using native plants. Consider managing seasonal timing of grazing. For example, projects in the Trout Creek Mountains and Pueblo Mountain areas in the Northern Basin and Range ecoregion have increased willow, aspen, and grass coverage. Continue to develop and implement grazing regimes in partnership with landowners and grazing permitees that support riparian conservation objectives.

Factor: Loss of habitat connectivity: Riparian habitats are important movement corridors for wildlife, but habitat loss has resulted in reduced area and connectivity of riparian habitats.

Approach: Enhance or re-establish the extent and connectivity of existing riparian habitats.

Factor: Water availability: Riparian bottomland habitats compete for water with other uses, particularly in the Blue Mountains, Columbia Plateau, East Cascades, and Northern Basin and Range ecoregions. In eastern Oregon, agriculture consumes much of the available water. Diversions occur at all major streams, and most valley bottoms have multiple canals that divert the water. As a result, riparian habitats no longer support the many channels and sinuosity that are characteristic of healthy stream systems.

Approach: Cooperative voluntary approaches which allow for purchase of instream water rights, prioritize use for agricultural purposes providing the greatest economic benefit, and maintain streamflow and water storage are important to riparian conservation.

Factor: Invasive plants: Invasive plants (such as knapweeds, knotweeds, reed canary grass, and thistles) degrade riparian habitats by competing with native plants. In the Columbia Plateau and Northern Basin ecoregions, pasture grasses and cheatgrass dominate the understory in some areas. In some riparian areas in the Northern Basin and Range, Columbia Plateau and East Cascades ecoregions, overgrazing has resulted in poor regeneration of hardwood trees and shrubs and change in plant species, including invasion by non-native grasses and forbs.

Approach: Emphasize prevention, risk assessment, early detection and quick control to prevent new invasives from becoming fully established. Control key invasive plants using site-appropriate tools, including mechanical, biological and chemical treatments. Use chemical treatment carefully and where compatible with water quality concerns, focusing on spot treatment during the dry season. In the Columbia Plateau and Northern Basin and Range, focus control at low elevation sites, unless near streams (seeds could flow downstream). Provide information to local governments and landowners about potential invasive plants. Where necessary (i.e., some areas in the Northern Basin and Range, East Cascades and Columbia Plateau ecoregions), develop and implement grazing management regimes that are compatible with riparian conservation objectives.

Cooperative Conservation Project: Landowner's vision, values at heart of Wallowa River restoration project

Doug McDaniel remembers when the Wallowa River meandered naturally through his family's property and the river was defined by its rugged character and healthy in-stream and riparian habitat for fish and wildlife. Since then, significant stretches of the Wallowa River, a tributary of the Grande Ronde, were straightened and pushed aside to accommodate rail, roads and pasture for livestock. Changing a river's course was standard practice well into the 20th century but the ecological effects of this engineering achievement were unknown or not considered until recently. The physical changes increased the riverbed's gradient and water velocity while overgrazing of streambanks and adjacent meadows led to less plant cover critical to maintaining the river's ecology and hydrology.

Today, with technical and financial assistance from private, government and tribal partners, McDaniel is restoring his reach, or approximately 2,550 feet, of the Wallowa River near Lostine in Wallowa County. Primary partners, led by Wallowa Resources of Enterprise, include ODFW,

USDA's Natural Resources Conservation Service, and the Grande Ronde Model Watershed Program. Construction of an oxbow will recreate the river's historically winding path and the addition of rootwads and rocks to the new channel will reduce water flow and improve instream habitat for anadromous and resident aquatic species such as steelhead and chinook. Restoring the river's surrounding wetland also is a priority. Improvements to riparian and meadow habitat will benefit a host of wildlife species that utilize this habitat for nesting, hiding cover, or winter forage.

Financial support for the restoration project has come from a variety of sources, including McDaniel, the landowner. The Bonneville Power Administration and the Oregon Watershed Enhancement Board have awarded grants to support excavation of the new channel and revegetation of the riverbank. Revenue from the sale of gravel removed from the newly excavated riverbed on McDaniel's property is also helping to pay for restoration activities.

No other restoration project of this magnitude has been undertaken in the region and the partners hope McDaniel's actions will inspire other landowners to carry out similar efforts.

Cooperative Conservation Project: 'CREP' funds enhance tribal, private efforts to restore creek

Since 1994, the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) have worked steadfastly with private landowners to improve water quality in Wildhorse Creek, which receives and transports tons of sediment from upland fields downstream into the Umatilla River. Consequently, sediment-laden water flowing into the Umatilla River from Wildhorse Creek poses a threat to salmon and steelhead known to spawn in the river.

Three quarters of the land in Wildhorse watershed is privately owned and under intensive cultivation so efforts to improve water quality and habitat for native fish hinge on the voluntary conservation practices of landowners. The CTUIR has relied on funding from the Bonneville Power Administration, the Bureau of Indian Affairs, and the U.S. Fish and Wildlife Service to carry out the lion's share of restoration work. Another source of federal funding, the Conservation Reserve Enhancement Program (CREP), promises to build on tribal efforts in the Wildhorse Creek watershed by encouraging agricultural producers to reduce soil erosion and restore natural vegetation along stream banks. CREP, funded by the U.S. Department of Agriculture and administered by the Farm Service Agency, makes annual rental payments to landowners who install or protect vegetative buffers along fish-bearing streams that cross their crop fields or pastures. Typically, landowners enrolled in CREP construct livestock exclusion fences to restrict grazing animals from streams or plant vegetation to rehabilitate riparian areas and protect aquatic species.

Containing some of the most productive farmland in the Umatilla Subbasin, Wildhorse Creek watershed is an important area for agricultural production. Today, 90 percent of the watershed is cultivated for dryland crops. Tilling the soil and removing upland and riparian vegetation to maximize the amount of land under production has contributed to soil erosion, elevated levels of in-stream sediment and altered the floodplain's hydrology to the detriment of salmonids. Excessive sedimentation smothers gravel beds used by spawning salmon, cutting off the supply of oxygen to developing salmon eggs. Moreover, inadequate streamside vegetation reduces shading, causing stream water temperatures to rise and placing greater stress on salmon.

So far, restoration activities include the planting of thousands of locally grown, native shrubs and trees, including choke cherry, elderberry, willow and cottonwood, along a mile of Wildhorse Creek. Smooth-wire fences have been erected to limit livestock access and impacts to help the vegetation recover. Sediment retention structures have also been installed in the stream channel to decrease in-stream erosion and capture top soil runoff from nearby fields. The creek passes through S & M Farms, owned by Bud Schmidtgall, who agreed to take some of his land out of production for 15 years in the hopes that bringing back natural vegetation is in the long-term interest of his business. As the creek's hydrology improves and the water table rises, portions of Schmitdgall's pasture that have been too dry for grazing will once again be fertile.

In the Wildhorse Creek watershed, several landowners have recently enrolled their streamside property in CREP. Statewide about 400 landowners and more than 700 stream miles are enrolled in CREP, with some 14 million in federal dollars dispersed under the program as of September 2003. Landowners who choose to sign up for CREP must enroll their land for at least 10 years but may extend their agreement up to 15 years. CREP requirements may soon be relaxed by expanding the definition of eligible streams to those that are not used by protected fish species. This change would increase the pool of potential landowners who qualify for the program.

The CTUIR identifies willing and qualified landowners to enroll in CREP. To date, the tribes have facilitated the transfer and maintenance of three stream miles of private land under the program in Wildhorse Creek watershed.

Cooperative Conservation Project: Local Land Trust-Utility Partnership Energizes Conservation Efforts

Residents of Eugene, Oregon drink some of the cleanest water in the country, according to national tests. The source of this drinking water is the McKenzie River, which originates in the Cascade Mountains and flows west, eventually emptying into the Willamette River.

The quality of the river's water is largely due to the health of the surrounding watershed, which harbors a variety of fish and wildlife, including the Willamette Valley's last sustainable run of wild chinook salmon. Much of the land in the watershed is federally protected as wilderness, restricting activities that might otherwise impact the key hydrologic functions of upland and riparian forests as natural filters and sponges. Private landowners and organizations also deserve credit for protecting the watershed and the ecological services it provides.

Endeavoring to conserve and enhance the watershed's habitat, fish and wildlife is the McKenzie River Trust (MRT), a private land trust that works toward this goal by partnering with private landowners, conservation organizations and, recently, a local utility. In 2000, the Eugene Water and Electric Board (EWEB) made a significant financial contribution to the McKenzie River Trust, enabling the organization to acquire and protect more than 1,000 acres of critical habitat.

The relicensing of the Leaburg/Walterville hydroelectric facilities in 1990 prompted calls within the community for EWEB to fund conservation work in the watershed. Ultimately, the utility donated $1 million in outright and matching grants to MRT after concluding that an investment in land conservation and habitat protection would benefit local residents by maintaining watershed function, water quality and fish and wildlife populations for years to come. Other stakeholders who stand to gain from long term protection of natural habitat are tribes, hunters, anglers, and wildlife viewers who utilize wildlife for cultural and recreational reasons.

Some of EWEB's donation was used by MRT to acquire the 47-acre White Branch Creek property off of the historic McKenzie River Highway 242, which has an abundance of wetlands, seeps, springs important to bull trout and wintering elk. Further downstream MRT acquired with EWEB funds the Big Island property whose side channels and slack water is essential habitat for the recently rediscovered Oregon chub, an endemic fish thought to have gone extinct in the McKenzie. MRT carried out a number of EWEB-funded conservation projects in the McKenzie River Watershed and established 25 partnerships with a diversity of stakeholders that continue to this day.

Cooperative Conservation Project: Untangling a knotty problem along the Sandy River

The Sandy River Watershed symbolizes the ecological fragility and importance of watersheds located in the shadow of large cities. Despite its proximity to Portland's suburbs, the Sandy River Watershed supports a remarkable diversity of animals ranging black bear and elk to neo-tropical migratory birds to amphibians. Anadromous fish such as federally protected chinook salmon and steelhead trout spawn and take shelter in the Sandy and its tributaries. In addition to its wealth of fish and wildlife, the watershed provides Portland area residents with drinking water, which ranks among the cleanest in the country.

While the river and its upland habitat bear many of the biological hallmarks of a healthy system, they also show signs of distress resulting from past and present human activity, including the seemingly innocuous human pastime of gardening. Unbeknownst to early residents, their decision to plant knotweed set the stage for a botanical invasion of the

Black Cottonwood and Wildlife

To many people, the spicy-sweet smell of cottonwood buds herald the warming days of spring. Birds value cottonwoods in the spring as well. Early migrant songbirds headed north to their breeding grounds are dependent on the insect food resources that occur first in these lowland riparian habitats while the forests and montane habitats are still under a blanket of winter. Large cottonwood trees and the gallery forests that form where stands of mature cottonwood trees occur, often are referred to as a "keystone" species or habitat. That is, they have a large impact on the ecosystem relative to their abundance on the landscape. Breeding and migratory bird densities in these cottonwood habitats are generally the highest of all habitat types in North America.

Mature stands of cottonwood trees also are essential nesting habitat for larger birds that need big trees for their nests such as bald eagles, great-horned owls, and a number of colonial nesters including great-blue herons. Mammals, amphibians and reptiles often are abundant in streamside habitats throughout Oregon. Through cooperative efforts such as The Oregon Plan for Salmon and the Willamette Restoration Initiative, riparian habitats are being restored. Initial efforts of wood placement, invasive non-native plant control, and riparian vegetation planting have begun to show early positive benefits. Maintenance of cottonwood gallery forests also will require new tools for restoring vital floodplain functions.

Sandy River Watershed that threatens to undermine the river's ecology. A native of Asia, knotweed probably escaped from private gardens and traveled downstream in the form of root fragments to establish new patches in freshly disturbed soil in the floodplains and cobble bars of the Sandy River. The catastrophic flood of 1996 is believed to have been a significant event and vector in helping knotweed expand beyond the sites where it was previously confined.

Knotweed is the botanical equivalent of the Hydra, the creature in Greek mythology that sprouted two new serpent heads for every head severed. Reproducing asexually from splintered rhizomes or even broken stems, knotweed can easily establish new patches from mother plants. Cutting knotweed stems down to the ground only encourages regrowth and mechanical removal can split roots or stems into pieces that disperse and form new patches down river.

Growing 13 feet or more each spring, knotweed effectively shades and displaces native riparian vegetation such as graminoids, shrubs, alders and willows. Native riparian plants provide critical breeding habitat or shelter for up to 90 percent of the wildlife species in any given watershed so the decline or displacement of native flora by knotweed can be detrimental to wildlife. Native shrubs and trees are important sources of in-stream woody debris, which help create favorable conditions for salmonid spawning and rearing. Moreover, knotweed's roots do not hold sediment as effectively as native plants, increasing the likelihood that sediment will accumulate on the riverbed floor and smother fragile salmonid eggs buried in the gravel.

Chemical treatment, either by spraying foliage or directly injecting the hollow stems, appears to be the only reliable way of destroying the persistent weed and this is exactly what The Nature Conservancy (TNC) has been doing, plant by plant, in the Sandy River Watershed. In 1998, TNC first detected knotweed patches on its Cornwell preserve in the Sandy River Gorge. Realizing the plant was a prolific weed and a potential ecological menace, TNC spearheaded a comprehensive, multi-year effort to survey knotweed's presence in the Sandy River Watershed and treat patches to bring the plant under control.

A major logistical challenge has been securing access to properties owned or managed by thousands of landowners ranging from individuals to government agencies. Building and maintaining relationships with hundreds of landowners was and remains a top priority of TNC. Jonathan Soll, TNC's Portland Area Preserve Manager, says "the cooperation exhibited by numerous, diverse landowners and TNC on knotweed control underscores what can be achieved when a conservation organization works in good faith with stakeholders."

Tony Lasher of the Resort on the Mountain in Welches echoes this sentiment, saying "Led by The Nature Conservancy and involving multiple partners, controlling knotweed on resort property has been a successful team effort. Treatment of invasive plants is part of a broader commitment by the resort to restore riparian and in-stream habitat, which we believe has helped bring back naturally spawning, wild coho. This work demonstrates that stewardship is compatible with use of the land as a golf course."

The Nature Conservancy also has partnered with several agencies and organizations whose funding, in-kind assistance or other services played a critical role in helping the organization wage a successful campaign against knotweed.

As of October 2004, The Nature Conservancy had surveyed and treated knotweed patches along more than 60 miles of the Sandy River or its tributaries. TNC has made significant progress in controlling knotweed, especially in the lower Sandy River where the number and density of stems has decreased 80 percent. TNC's efforts continue in earnest, with increasing energy and focus on the middle and upper Sandy River and its major tributaries of the Salmon River, Cedar Creek, Hackett Creek and Still Creek.

TNC's goal is to contain knotweed to the point where a local organization can take over much of the work and sustain the necessary level of landowner outreach, monitoring and treatment to minimize the plant's invasion and impacts in the Sandy River Watershed.

Cooperative Conservation Project: Ranchers and BLM restore at-risk aspen, rangeland potential

Private landowners, a local watershed council and the Bureau of Land Management have been working together to improve the health of Kiger Creek watershed in what has become a landscape dominated by western juniper. Low densities of western juniper, especially older stands, can be ecologically beneficial and provide valuable habitat to wildlife. However, the conversion of native plant communities like sagebrush, bunchgrasses and aspen to western juniper has implications for species that depend on these habitats for food or shelter. While the causes of juniper expansion are complex, most researchers agree that decades of fire suppression have allowed juniper to flourish.

Since the 1970s private landowners and public land management agencies in the Steens Mountains have been concerned about the impacts of juniper encroachment on local watersheds and wildlife. In areas of high juniper density, less precipitation feeds surface springs and streams because juniper plants intercept and transpire water back into the

atmosphere. As the carpet of native grasses converts to juniper, the soil hardens and runoff potential increases. One of the most significant changes to watershed function in the Kiger drainage has been the replacement of streamside stands of quaking aspen and other deciduous trees by juniper. Quaking aspen is a unique yet increasingly rare plant community because stands rely almost exclusively on the formation of new shoots from parent trees to replace themselves. Without the benefit of cross-pollination and seed production, aspen stands are genetically isolated and vulnerable to displacement by conifers like western juniper.

One of the participating private landowners, rancher Fred Otley, attributes the success of the watershed-wide restoration effort to the collaboration of multiple parties and to involving landowners along every step of the way. A grant from the Oregon Watershed Enhancement Board provided a third of the funding to the Harney County Watershed Council, which orchestrated the large-scale watershed and wildlife enhancement project. This funding enabled Fred's family ranch, along with neighboring rancher, Hoyt Wilson of Mann Lake Ranch, to cover costs associated with their portion of restoration work in Kiger Creek watershed.

The watershed restoration partnership used a combination of management approaches to remove juniper and facilitate the recovery of sagebrush, grasses and quaking aspen. Controlled burns on several thousand acres overgrown with juniper had the most promising results, with the number of young aspen trees increasing five-fold. What were stands of dying aspen before the prescribed burn are now healthy again, doubling in acreage in many areas. Oregon State University and USDA's Agricultural Research Service have established monitoring plots on Otley's property and BLM lands to document changes in habitat and watershed condition.

Fire-induced restoration helps wildlife by bringing back a diversity of plants, reduces erosion run-off by promoting regrowth of ground vegetation and gives ranchers like Otley greater flexibility in managing their livestock. Otley says that "following a rangeland burn grasses return in vigor and in greater diversity, giving me the level of comfort I need to change the rotation, timing and duration of grazing." If forage is plentiful a rancher can distribute cattle over a wider area for a more even graze, reducing the potential for overgrazing.

The voluntary efforts of private landowners like Fred Otley and Hoyt Wilson combined with the support of government and local organizations testify to the importance and effectiveness of private-public partnerships in carrying out watershed-wide restoration projects.

The Splash Zone

When two very different habitats come together, the transition zone often is home to diverse variety of species, including some rare or highly unusual species. Along the banks of swift-flowing streams and under the continuous tumbling of waterfalls, the splash zone is such a habitat. The splash zone hosts a diverse array of plants, amphibians and invertebrates that benefit from occasional or continuous water spray, but are otherwise adapted for life on the land. Even some birds take advantage of this unique habitat. Because water spray provides moisture in all but the driest months and moderates air temperatures, the splash zone provides a relatively stable microclimate. Ferns, sedges, saxifrages, goatsbeard, elkclover, mosses, and liverworts form a lush border around streams and waterfalls. In the Cascade Mountains, torrent salamanders, Dunn's salamanders, Cope's giant salamanders, and adult tailed frogs are frequently found in these splash zones, although they are also well adapted to other areas such as riparian habitat, wet talus and seeps near stream headwaters. American dippers forage in these areas, often nesting in holes in basalt streambank cliffs that are kept moist by continuous splashing. Black swifts frequently nest behind waterfalls. Some unusual and delicately beautiful wildflowers also occur near waterfalls, including mistmaiden, bronze bells and the endemic Oregon sullivantia.