



Stepping Down from

STATEWIDE TO LOCAL:

CONSERVATION REVIEW & TECHNICAL INFORMATION

The issues that affect fish and wildlife populations occur at many scales. For example, a misaligned culvert can prevent fish from traveling up a small stream. This local effect can best be addressed by replacing the culvert, a local action. Larger-scale problems, such as high fuel loads that allow a severe wildfire to sweep through several square miles of forest or rangeland, need coordinated, larger-scale solutions.

Over the past three decades, many Oregonians have come to recognize the degree to which people have changed the landscape of the state and in so doing affected the fish and wildlife populations that depend on it. At the same time, there has been a growing recognition among land managers, researchers and policy makers that nature works on many scales. These scales need to be considered when conserving both species and their habitats across broad landscapes, as well as local sites. The Conservation Strategy considers several scales of analysis and action, which are presented in this section:

- **Statewide Perspectives and Approaches** - This chapter describes fish and wildlife conservation issues and actions that apply throughout Oregon. It includes discussions about the six key conservation issues; conservation in urban areas; Conservation Strategy outreach; environmental education and wildlife tourism; voluntary conservation tools; and monitoring.
- **Ecoregions** - This section steps down a scale to the ecoregional level. From the sandy beaches of the coast to the deserts near the Nevada border, Oregon is ecologically diverse. Similarly, the economies and local cultures vary across Oregon. As a result, conservation issues will play out differently in each ecoregion. This chapter presents a portrait of each ecoregion by describing characteristics, summarizing Strategy Species and Habitats,

listing some issues and conservation actions, and profiling the Conservation Opportunity Areas.

- **Strategy Habitats** - This chapter steps further down to the habitat level, and presents information about Strategy Habitats from local, ecoregional, and statewide viewpoints.
- **Strategy Species** - This chapter steps down to the species level and discusses individual species as well as some topics that apply to multiple species including animal concentrations and diseases. It summarizes the requirements, limiting factors, data gaps, and conservation actions for Strategy Species.

Statewide Perspectives and Approaches

Just like stepping back from a painting can provide an entirely different image, viewing conservation issues and opportunities from a statewide perspective can provide new insights. Granted, conservation problems and their corresponding solutions often occur at the grassroots level. Neighbors can pull together to clean up a stream or remove invasive English ivy from a park. However, some issues occur throughout the state, adding up to statewide problems. Because of their scale and complexity, these issues must be tackled through organized, coordinated, and comprehensive approaches.

Similarly, making the most efficient and effective use of the many good voluntary conservation tools to address issues requires evaluating entire programs to look for ways to better support conservation work by landowners. Monitoring programs, as well efforts to engage Oregonians through Conservation Strategy outreach, need to be considered and implemented throughout the state. This is the “big picture” chapter that addresses conservation issues and opportunities, needed actions and current efforts across the state.



Photo © Jennifer Thompson, U.S. Fish and Wildlife Service

Six Key Conservation Issues that Affect Species and Habitats Statewide

There are some large-scale conservation issues that affect or potentially affect many species and habitats over large landscapes and throughout the state. They also affect people, by reducing land productivity, altering water supplies, or increasing risk of severe wildfires. Invasive species and wildfires do not abide by “No Trespassing” signs, and neither do fish and wildlife. As a result, problems affecting large areas must be considered in a larger context, and across jurisdictional and ownership boundaries.

Oregon Department of Fish and Wildlife, working with the Stakeholder Advisory Committee, identified six key conservation issues. They are presented on pages seven to 10 of the “A Strategy for Action: Overview and Highlights” summary. The Stakeholder Advisory Committee also identified Global Warming as an issue with the potential to impact fish and wildlife in the future. Because there are ongoing statewide and interstate planning efforts for this issue, Oregon Department of Fish and Wildlife did not include it in this Conservation Strategy. Global warming is briefly discussed in Appendix VI on page a48.

In this Chapter, the key conservation issues are addressed in greater detail, with overviews of the issues and information on recommended actions. For all recommended actions, implementation will depend on cooperative efforts by a variety of entities and may be contingent on funding, statutory authority, and other factors. Actions need to be compatible with local priorities, local comprehensive plans and land use ordinances, as well as other local, state, or federal laws. Actions on federal lands must undergo federal planning processes prior to implementation to ensure consistency with existing plans and management objectives for the area.

In many cases, these actions are already occurring and should be continued or expanded. In other cases, new actions are identified. Ideally, new actions should be implemented, monitored and adapted accordingly.

Goals and Actions for all Key Conservation Issues

The Conservation Strategy takes a voluntary, non-regulatory approach to addressing conservation in Oregon. This is the thread that ties together all of the conservation issues. The common theme for all key conservation issues is to foster and support voluntary efforts by Oregonians.

Overall Goals for the Conservation Strategy: maintain healthy fish and wildlife populations by maintaining and restoring functioning habitats, prevent declines of at-risk species, and reverse any declines in these resources where possible. Reducing and reversing the impacts of the key conservation issues can contribute significantly to these goals, while also contributing to healthy human communities.

Overall Recommended Actions for all Key Conservation Issues:

- a. Work with community leaders and agency partners to ensure planned, efficient growth, and to preserve fish and wildlife habitats, farmland, forestland and rangeland, open spaces, and recreation areas.
- b. Use, expand, and improve financial incentive programs and other voluntary conservation tools to support conservation actions taken by landowners and land managers.
- c. Develop new voluntary conservation tools to meet identified needs.
- d. Promote collaboration across jurisdictional and land ownership boundaries.
- e. Work creatively within the existing regulatory framework, seeking new opportunities to foster win-win solutions.
- f. Inform Oregonians of conservation issues and the actions everyone can take that will contribute to Oregon's collective success.

ISSUE 1: Land Use Changes

People's presence on the land has always altered the shape, appearance, and function of ecosystems. Native Americans, European settlers, long-time Oregonians, and today's newcomers have contributed to land use patterns that affect fish and wildlife populations.

Oregon's human population is increasing, which means greater demand for urban, residential, and industrial areas. An estimated 3,541,500 people lived in Oregon in 2003, and Oregon's mild climate, spectacular vistas, and easy access to outdoor recreation will continue to attract new Oregonians. The Willamette Valley is home to 70 percent of Oregon's people and the population is anticipated to nearly double in the next 50 years. Other areas of the state such as Bend-Redmond-Sunriver, Grants Pass, Medford and coastal communities including Brookings and Florence are experiencing population booms. As a result, conversion of natural areas, farmland and forestland to other uses is expected to increase.

Land use change, whether from native vegetation to farmlands or from farmlands to residential neighborhoods, can result in the disruption of natural disturbance regimes (fire and flooding) and can result in habitat loss and fragmentation.

Urbanization poses particular problems. Conversion to more urban uses increases the amount of impervious surfaces, which alter surface and water flow, degrade water quality, and reduce vegetation cover and diversity. The changes made to the landscapes tend to be permanent and restoration to a natural state is difficult if not impossible. However, contained, well-designed urban growth can minimize impacts to surrounding landscapes and conserve habitat values. Conservation within urban areas is discussed further starting on page 65.

Oregon's Land Use Planning Heritage

Oregon has many opportunities today to conserve, restore, and improve fish and wildlife habitat. A major reason is Oregon's statewide land use planning program, which has prevented sprawling development in farm, forest and rangelands.

Prior to the 1960s, population growth was not broadly perceived as a concern in Oregon. However, between 1940 and 1970, Oregon's population grew 109 percent. Subdivisions sprouted next to farms in the Willamette Valley and Oregonians saw their pastoral landscape threatened by sprawl. Governor Tom McCall and farmer-turned-senator Hector MacPherson collaborated on the legislation that created Oregon's land use planning program. (See discussion of Oregon's land use program in Appendix II starting on page a13.) The system's 19 goals

include Goal 14 that establishes urban growth boundaries around each city or metropolitan area to separate urban land uses from farm and forest working landscapes. These boundaries are reevaluated periodically to maintain a 20-year supply of buildable land. By concentrating people and associated impacts, compact urban areas reduce the overall footprint on the land.

Comprehensive land use plans were in place across Oregon starting in 1982. By most accounts, the land use program has been reasonably successful in containing sprawl, in that "leapfrog" development has been largely curtailed. However, as the population has grown the urban growth boundaries have expanded. Some call this "contained sprawl."

Oregon's land use laws have helped maintain the state's forest and farm lands, which provide habitat for many fish and wildlife species. Although Goal 5 addresses natural resources, scenic and historic areas, and open spaces, Oregon's land use planning system was not intended for conserving native vegetation. In "No Place for Nature," the author Pam Wiley explored the limits of Oregon's land use planning program in conserving fish and wildlife habitats in the Willamette Valley. In her conclusion, Wiley notes that land use planning is best viewed as one part of an integrated, multi-tiered approach to addressing fish and wildlife needs. Such an integrated approach could build on current programs to include broader regional approaches, expanded use of voluntary conservation tools, and restoring ecological processes.

However, there is new uncertainty in Oregon's land use planning system. During the November 2004 elections, Oregon voters passed the voter initiative Ballot Measure 37 by 1,054,589 (61 percent) to 685,079 (39 percent). Ballot Measure 37 provides that the owner of private real property is entitled to receive just compensation when an enacted land use regulation restricts the use of the property and reduces its fair market value. In lieu of compensation, the ballot measure also provides that the government entity responsible for the regulation may choose to "remove, modify or not apply" the regulation. The implications of Ballot Measure 37 on landowners and agencies are not entirely clear due to differing interpretations of the measure, litigation, and possible legislative clarifications. Some local jurisdictions have enacted waiver systems to implement the measure. Passage of Ballot Measure 37 poses significant challenges for effective local planning and increases the need for improved voluntary approaches to conservation.

Recent Patterns in Land Use Changes

The legal and institutional framework for maintaining private forestland in economically viable use is already in place through the Forest Pro-

Dominant Land Use on Private Land in Western Oregon 2000

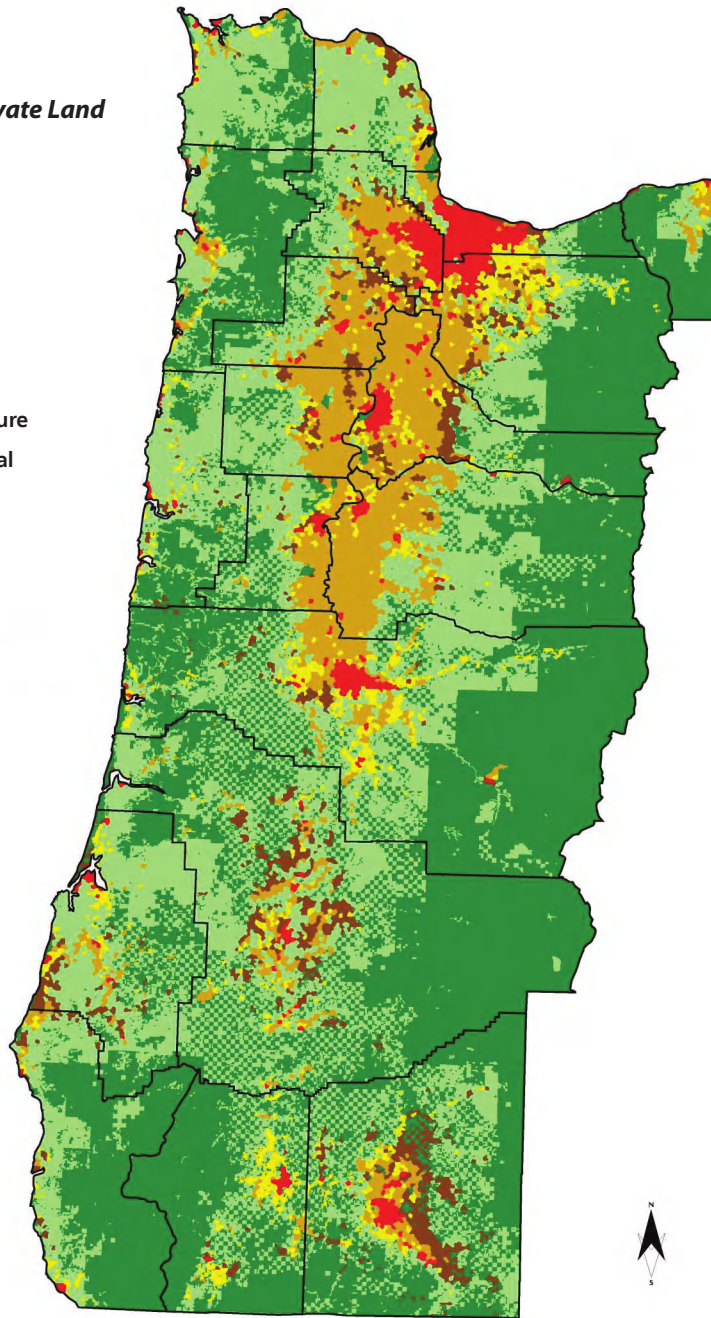
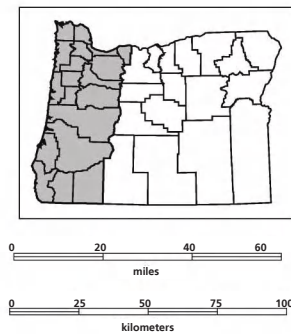
Private Land

- Wildland Forest
- Intensive Agriculture
- Mixed: Forest/Agriculture
- Low-Density Residential
- Urban

Public Land

- USFS, BLM, NPS, State

Source: Forests, Farms and People: Land Use Change on Non-federal Lands in Western Oregon (2002).



gram for Oregon, the Forest Practices Act, and statewide planning Goal 4, Forest Lands. Oregon's forestlands are extremely important from an economic, social and environmental perspective. Continued support for the existing legal and institutional framework is necessary to maintain forestlands in economically viable forest use. Forestlands developed for other uses will produce less timber, fish and wildlife habitat, and other traditional forest values on a sustainable basis. Maintaining Oregon's forestland base is critical to securing habitat for many forest-obligate fish and wildlife species. Similarly, pastures and rangelands provide habitat for species dependent on more open landscapes. Maintaining these traditional land uses also is extremely important for maintaining rural economies and traditional lifestyles.

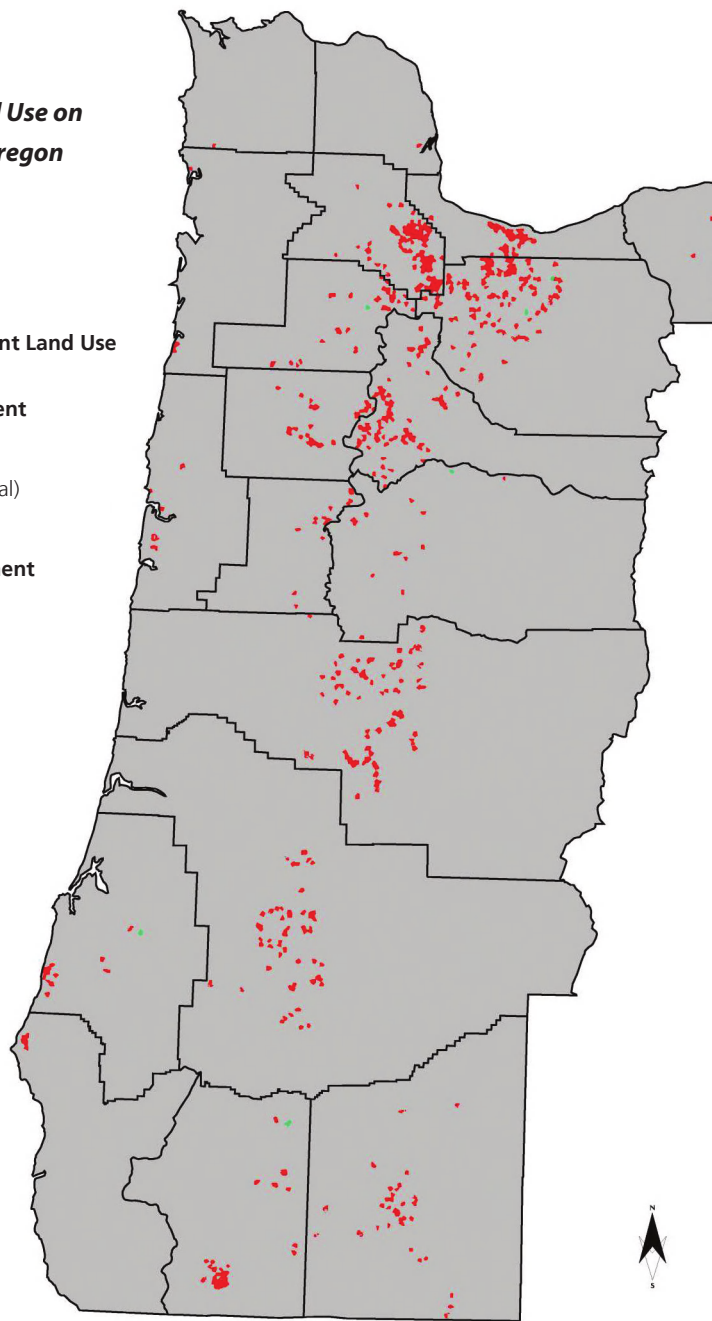
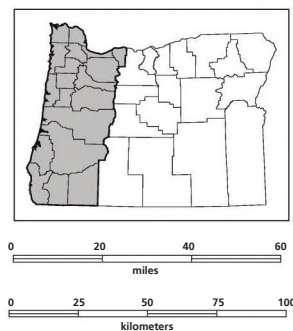
The Natural Resource Conservation Service has tracked land conversion in Oregon and estimates that during the period of 1982-1997, the total resource lands converted to rural residential and urban uses was 293,400 acres. That includes loss of crop, pasture, range and forestlands.

In the publication "Forests, Farms and People: Land Use Change on Non-federal Lands in Western Oregon" (2002), the authors noted that population sprawl is cause for concern, even on forest and agricultural lands that have thus far remained intact for their designated use. "While the amounts and uses of western Oregon's forests and farms are stable in areas zoned primarily for agriculture or forest uses,

**Change in Dominant Land Use on
Private Land in Western Oregon
1973-2000**

- No Change in Dominant Land Use
- Increase in Development
(Forest to Mixed)
(Forest to Agriculture)
(Agriculture to Residential)
(Residential to Urban)
- Decrease in Development
(Agriculture to Forest)

Source: *Forests, Farms and People: Land Use Change on Non-federal Lands in Western Oregon* (2002).



dwelling density continues to increase within forest, agriculture and mixed forest/agriculture-dominant land uses within these areas.” The report cautions that development could begin to reduce the economic and ecological benefits produced from these lands. Eighty-nine percent of non-federal lands in western Oregon are in forest and agricultural use, but 80 percent of the land use changes between 1973 and 2000 were from agriculture or forest to low-density residential or urban uses.

In 2004, a companion report published for eastern Oregon documented that 97 percent of non-federal land in eastern Oregon was in forest, range, and agricultural land uses. However, between 1975 and 2001

the largest percentage gains in acreage were a 62-percent increase in low-density residential and a 54-percent increase in urban uses.

These documents also state that “Oregon’s land use program appears to have been successful in reducing the overall rate of conversion of forest, range, and farmlands to more developed uses and has been demonstrably successful at containing urban expansion within areas zoned for more developed uses. Despite this, dwelling density continued to increase within forest, agriculture, and mixed forest/ range/agriculture dominant uses.”

Dominant Land Use on Private Land in Eastern Oregon 2001

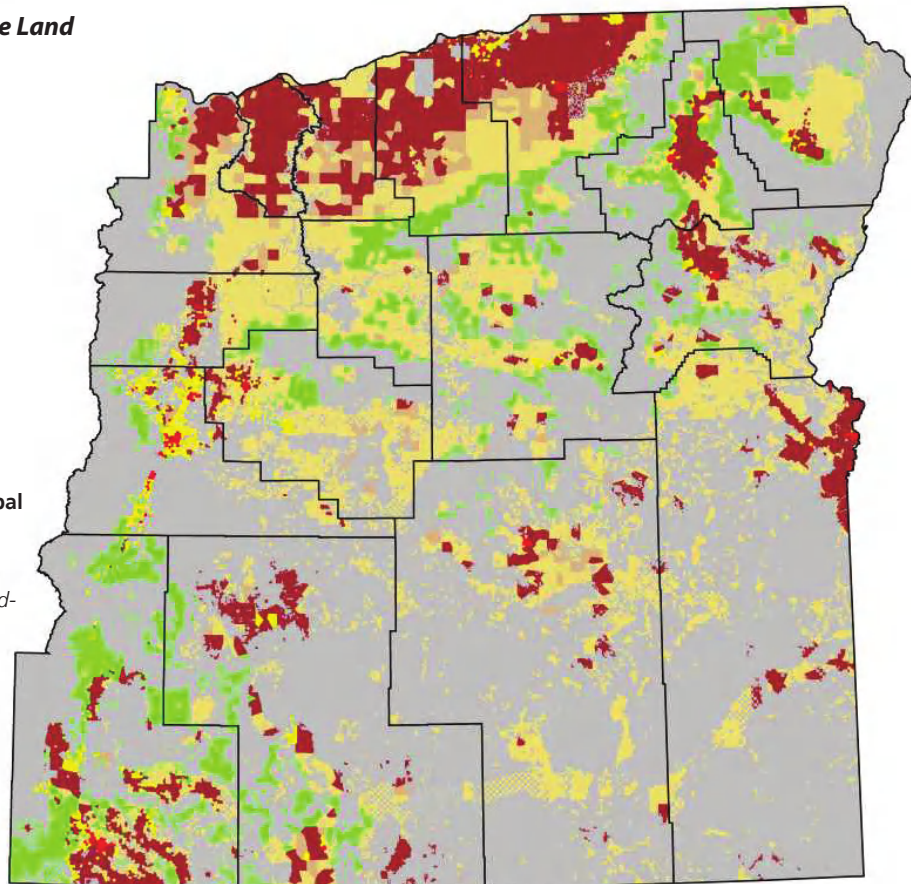
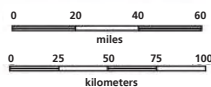
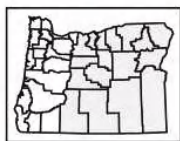
Private Land

- Wildland Forest
- Wildlife Range
- Agriculture
- Mixed
- Forest/Range/Agriculture
- Low Density Residential
- Urban

Public Land

- USFS, BLM, NPS, State, Tribal

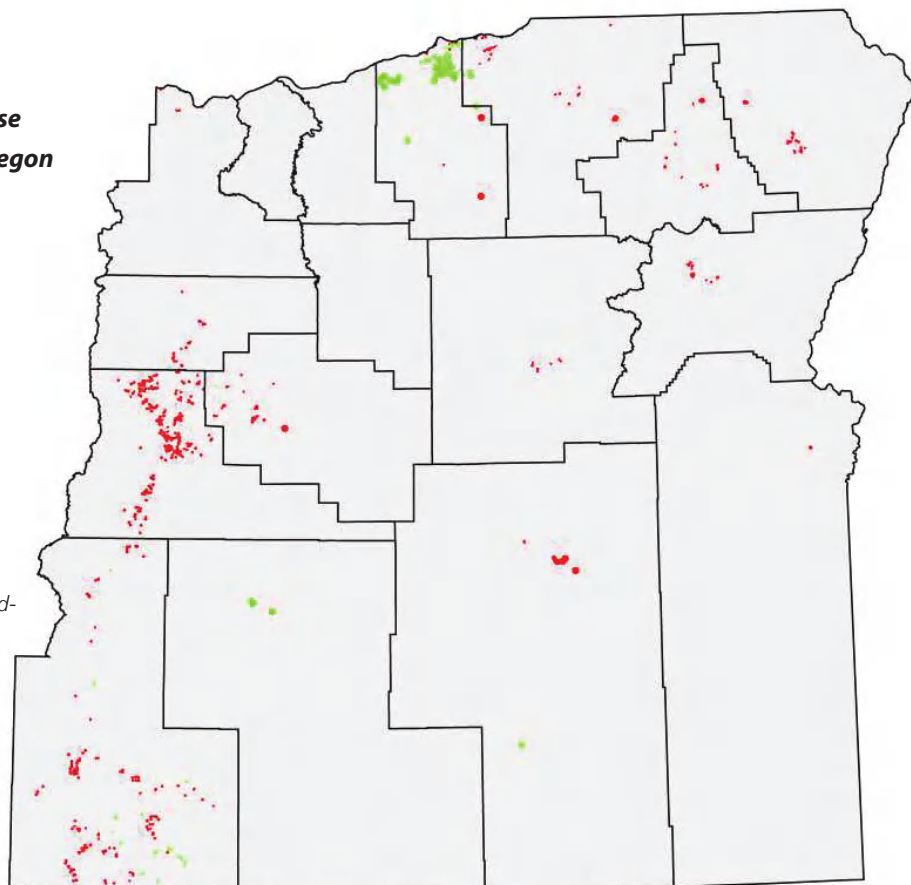
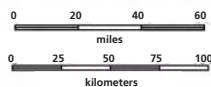
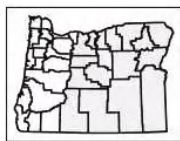
Source: Land Use Change on Non-federal Lands in Eastern Oregon (2004).



Changes in Dominant Land Use on Private Land in Eastern Oregon 1975-2001

- No Change in Zone Class
- Increase in Development
- Decrease in Development
- Change in Agriculture

Source: Land Use Change on Non-federal Lands in Eastern Oregon (2004).



Though western Oregon's rural forests and farms are holding up in the state's growth spurt, such lands close to centers of development have experienced change. The most significant shifts occurred on private land in the Willamette Valley, particularly in areas close to the Portland Metropolitan Area and other urban areas; in the Bend-Sunriver-Redmond region; and in southern Klamath County.

Oregon is at a crossroads regarding its land use planning heritage. Growth is not incompatible with maintaining fish and wildlife populations, but it must be planned carefully and deliberately. Ideally, Oregonians from across the state will work together to maintain Oregon's ecological integrity while meeting the demands of a growing population.

GOAL AND ACTIONS

Goal: Manage land use changes to conserve farm, forest and range, open spaces, natural recreation areas, and fish and wildlife habitats.

Actions:

- **Action 1.1. Conserve Strategy Habitats using voluntary, non-regulatory tools such as financial incentives, conservation easements, landowner agreements and targeted acquisition.**

People own land for different reasons and need a range of incentives and conservation tools to compliment each landowner's unique circumstances. The Conservation Strategy provides a summary of voluntary, non-regulatory approaches to conserving habitats and recommendations to further assist willing landowners (See Voluntary Conservation Tools starting on page 70). There are several tools available for conserving habitats and preventing changes to other land uses.

To ensure that limited funds address the greatest conservation need, many of these tools can and should be focused on Strategy Habitats when compatible with individual program purpose and intent. Additionally, a "conservation toolbox" could be developed to provide landowners and organizations with information on developing projects and accomplishing actions while maintaining economic uses.

- **Action 1.2. Encourage strategic land conservation and restoration within Conservation Opportunity Areas.**

Conservation actions taken across the state will benefit fish and wildlife populations. However, Conservation Opportunity Areas represent priorities for maintaining current land uses and restoring habitats through voluntary approaches. Because these areas are particularly important to certain species, have some of the best remaining habitats, and have fewer limiting factors, conservation focused in these areas is likely to be more efficient and effective at the landscape scale. These areas will be considered priorities for investing conservation dollars to implement Action 1, described above.

- **Action 1.3. Work cooperatively within existing land use planning processes to conserve Strategy Habitats, and optimize use of transferred development rights, conservation banking and other market-based tools to meet land use goals.**

Land use planning laws are part of the existing regulatory framework. The Conservation Strategy is entirely voluntary and non-regulatory; it does not expand, replace, supersede, or contradict existing regulations. Rather, the Conservation Strategy encourages innovative solutions within the existing regulatory framework. Transfer of development rights and conserva-

Nature in Neighborhoods – A Case Study Worth Watching

In 2004, the Portland area's Metro regional government approved a resolution to provide for incentive-based, voluntary stewardship programs focused on preservation and restoration of habitats, in conjunction with regulatory programs. As proposed, the Nature in Neighborhoods program will rely in part on voluntary, incentive-based approaches such as conservation education, expert assistance, restoration, incentives and willing-seller acquisition. Metro is collaborating with Oregonians, businesses and governments of the region to set and reach mutual goals.

An ordinance proposes to change the way cities and counties allow development to occur for the most valuable streamside habitat areas. Flexible development standards are intended to minimize the impact of development in habitat areas. The Nature in Neighborhoods program has not been implemented yet, but could provide a role model for other communities that want to promote voluntary conservation within local land use planning processes.

tion banking are both market-based approaches that allow local communities to meet local land use goals while allowing landowners and developers to still make a profit. Market-based conservation tools are discussed further under Voluntary Conservation Tools.

■ **Action 1.4. Create a system for tracking land use changes over time.**

Changes in Oregon's forestland and agricultural land have been monitored through two Oregon Progress Board benchmarks. The Natural Resource Conservation Service, Oregon Department of Agriculture, Oregon Department of Forestry, and others collect data regarding conversion of forest and agricultural lands to urban and other uses. However, little information exists pertaining to changes in Oregon's natural vegetation types over time.

The Oregon Progress Board has conceptually approved and is further developing a new benchmark for detecting changes in natural vegetation across the state. The benchmark will measure the amount and distribution of natural habitats in each of Oregon's eight ecoregions, sub-categorized by four major habitat types: wetlands and riparian areas, forests, shrublands, and grasslands. The Institute for Natural Resources at Oregon State University will consolidate the data and assist with the benchmark development process. This work will complement the existing Oregon Progress Board Benchmarks that measure changes in forestland and agricultural land.

This benchmark will be useful in measuring the changes in abundance and distribution of Oregon's natural vegetation. In addition, the underlying data can be a helpful aid in setting habitat conservation goals and determining whether they are collectively being met. Agencies can use this data to track long-term changes in the availability of suitable habitat for fish and wildlife on a coarse scale. Also, it can be used to model habitats to help determine which species might be at risk before they are listed as threatened or endangered, so that preventive measures can be taken. The data will be useful for all natural resource agencies, local governments, and development interests to evaluate the impacts of land conversion activities, global warming, and other forces that change Oregon's landscapes. This information on natural vegetation conversions could be combined with the existing data on forest and agricultural land conversion tracked by various agencies in a web-based portal. Such a portal would allow Oregonians and decision-makers to observe where and how land uses were changing.

■ **Action 1.5. Support local land use plans and ordinances that protect farm and forestlands and other fish and wildlife habitats in urban and rural areas.**

Decisions about land use occur at the local level through local comprehensive land use plans, Goal 5 (natural resources) planning, ordinances and other means. These local plans take into account local values, priorities, and needs. To implement this Conservation Strategy, agencies will need to work with local

The Willamette Futures Project and Project 2050 – engaging Oregonians in developing scenarios for the basin's future

In 1996, a five year effort began to look far ahead at land use, growth and conservation opportunities in the Willamette Basin, which expects a population increase of 1.7 million people, bringing the total to nearly 4 million people by the year 2050. The Pacific Northwest Ecosystem Research Consortium was formed to answer four basic questions: how have people altered the land, water and organisms in the last 150 years? How might the landscape change in the next 50 years? What are the environmental consequences of those changes? And what types of management actions are likely to have the greatest effects, and where?

The Consortium synthesized a variety of spatial and other data, and then worked with Oregonians to identify three plausible future scenarios for the basin. Plan/Trend represents a likely future if growth continues with current plans and present trend [before Ballot Measure 37];

Development portrays the landscape if current restrictions are loosened and emphasis is placed on economic gain; Conservation portrays the future if society emphasize ecosystem integrity and restoration in balance with social and economic considerations. The results were analyzed to identify effects on fish and wildlife, water quantity and land use.

The results were documented in the Willamette Basin Planning Atlas, Trajectories of Environmental and Ecological Change in 2002. A companion booklet, Willamette River Basin Challenge of Change, was published in 2005. Both provide insights on balancing environmental, social and economic needs and values. They also provide planning tools and ideas for everyone living and working in the basin, and discuss what was learned in the process.

community leaders and groups to find opportunities to incorporate Strategy Species and Habitats and Conservation Opportunity Area approaches into local plans that conserve farmlands, forestlands, open space, and natural areas.

ISSUE 2: Invasive Species

A biological invasion is underway across the United States and on every other continent. As elsewhere, non-native organisms are arriving and thriving in Oregon, sometimes at the expense of native fish and wildlife and the state's economy. The Conservation Strategy uses the National Invasive Species Council definition of invasive species: species that are not native to ecosystems to which they have been intentionally or accidentally introduced, and whose introduction causes or is likely to cause economic or environmental harm. Invasive plants are often called "noxious weeds." Many non-native species have been introduced to Oregon. While not all non-native species are invasive, some crowd out native plants and animals and become a serious problem.

Invasives: nature's nemesis

When an invasive species colonizes a new environment, it leaves behind the natural enemies such as predators or parasites that controlled its population growth in its original home. It can quickly expand, out-competing and overwhelming native species. Native species have not evolved the necessary survival strategies to fend off unfamiliar species or diseases.

Invasive species can have many negative consequences for Oregon. Depending on the species and location, invasive plants can affect food chain dynamics, change habitat composition, increase wildfire risk, reduce productivity of commercial forestlands, farmlands and rangelands, modify soil chemistry, accelerate soil erosion, and reduce water quality. Invasive species such as the non-native fish, wildlife, invertebrate and plant species listed in Section B, are the second-largest contributing factor causing native species to become at-risk of extinction in the United States. Invasive species also include disease-causing organisms such as viruses, bacteria, prions, fungi, protozoans, roundworms, flatworms, and external parasites (lice, ticks) that can affect the health of humans, livestock, and pets in addition to fish and wildlife. Invasive species cause significant economic damage to landowners by degrading land productivity or values.

Pathways of introduction

Every year, new non-native invasive species are documented in Oregon, bringing with them the threat of ecological damage. Many invasive species are introduced unwittingly by people, escaping detection until it is

too late to control their prolific expansion and devastating effects.

As the pace of globalization and cross-border trade increases, the risk of introducing non-native species via numerous pathways rises. Many new species will likely arrive as stowaways in agricultural commodities, seafood, livestock, wood products, packing materials and nursery stock imported into the state by land, air or ship freight.

There are other ways people can unknowingly introduce or increase the spread of invasive species. Mud on the soles of hiking boots or treads of off-road vehicles can contain seeds of noxious weeds. Oregon's rivers and lakes are vulnerable to undesirable aquatic invertebrates such as the highly invasive zebra mussel – an invader from Asia to the Great Lakes – which latches onto boat wells, hulls, motors or trailers in waters infested with its larvae.

People also have intentionally released new species into the environment. People depend on a variety of non-native plants for food, livestock feed, ornamental, medicinal and other uses. While most of these plants have little environmental effect, some -- such as foxglove and Armenian (Himalayan) blackberry -- escape into natural areas. Non-native fish, bullfrogs, and birds have been released to provide new fishing and hunting experiences. Nutria, which cause tremendous damage in agricultural areas, were released after failed attempts at raising them commercially for fur. People release pet amphibians, reptiles and mammals into backyards, and aquarium fish into local streams and ponds. Although perhaps well-intentioned, these releases are illegal in Oregon for many species.

Once introduced, natural pathways help to spread invasive species, especially plants whose seeds are easily dispersed by wind, water and wildlife. Certain land management practices can serve as conduits or create conditions that favor the spread of invasive organisms. Regardless of the pathway or practice implicated in the problem, experts believe that environmental disturbance is often a precursor to invasion by non-native plants. Invasive species are highly adaptable and competitive, using space, water and sunlight of disturbed ground. Following introduction and successful establishment, invasive species will increase their dominance and distribution until they reach the environmental and geographic limits of their expansion. Populations of invasive species will theoretically stabilize eventually but not before inflicting significant damage.

Although accidental or unintentional introductions of invasive species arriving in Oregon is inevitable, preventing invasive species from arriving in the first place is in everyone's best interest.

Assessing risk, prioritizing management

Evaluating the potential danger associated with new species is sometimes a relatively low priority as emphasis and urgency is often placed on control treatments. Natural resource managers and policymakers may not see the purpose or value in ranking introductions of non-native species in terms of risks posed. However, once invasive species are established, controlling them can be difficult, expensive, and in some cases impossible. Priority must be placed on preventing the establishment of new species. Also, not every new non-native species is equally threatening so gauging the level of risk and responding accordingly is important to avoid misallocating limited resources on species of low ecological concern.

This Conservation Strategy uses a systematic approach to assess the level of ecological threat from invasives species currently present in Oregon or likely to appear soon. These priority invasive species are listed in the Ecoregional descriptions starting on page 111. They were determined through an analysis of Oregon Department of Agriculture’s

Noxious Weed List, Oregon Department of Fish and Wildlife’s Wildlife Integrity Rules and Introduced Fish Management Strategies report, Oregon Invasive Species Council’s “100 Most Dangerous Invaders” list, information from Portland State University Center for Lakes and Reservoirs and local expert review. In developing these lists, Oregon Department of Fish and Wildlife coordinated with Oregon Department of Agriculture invasive species program staff. The scope was limited to terrestrial and aquatic vascular plants and vertebrates, as information on other organisms is not available.

Building on current planning efforts

Several other planning efforts are underway to protect Oregon from biological invaders. State statutes or agency administrative rules are in place to prohibit the unauthorized entry of undesirable invasive species. Together, the following plans and regulations provide a firm foundation for addressing invasive species and put the issue into clearer context for this Conservation Strategy: the Oregon Invasive Species Council’s Invasive Species Action Plan, Invasive Species Report Card, Oregon Nox-

Meeting the Invasives Challenge: A Framework for Action

Invasive species can be effectively managed and their potential ecological and economic impacts mitigated if the right precautions and steps are taken. The National Invasive Species Council has identified a framework of approaches in its plan, Meeting the Invasive Species Challenge: National Invasive Species Management Plan. These actions, or management approaches, are not a cure-all but can give states, counties, private landowners and public land managers a framework for prioritizing efforts to guard Strategy Species and Habitats and working landscapes against invading organisms.

For maximum effectiveness, all approaches in this Framework for Action should be integrated and carried out in a coordinated manner. The approaches need to be implemented at different spatial scales and across all jurisdictional and ownership boundaries. For instance, monitoring in the field aids site-specific management decisions. Reporting these data to a central database also is important for tracking changes in populations and distributions across the state. In another example, weed infestations on federally managed land and on adjacent privately property are more effectively controlled when federal land managers and private landowners join forces at the landscape level, across ownership boundaries.

Management Approach	Reason for Approach
Prevention	Preventing new species introductions is a top priority and most cost-effective approach to protecting native species, ecosystems and productivity of the land from invasive species.
Assessment/Risk Analysis	Defining the level of concern and risk associated with new introductions through an assessment process will help to identify the worst invaders and management priorities.
Monitoring	The importance of surveying cannot be overestimated when looking for first-time infestations of undesirable non-native species or evaluating efforts to control existing occurrences.
Early detection	Early discovery of infestations of previously undocumented non-native species is critical to controlling their spread and achieving complete eradication.
Rapid Response	Immediate treatment of new, isolated infestations will maximize eradication success and decrease the likelihood of populations expanding beyond the initial area of introduction.
Containment	Preventing invasive species from ‘hitchhiking’ via vulnerable pathways will slow the advance of well-established invasive species into unaffected areas. Some invasive species are tolerable if infestations can be contained and their impacts minimized.
Restoration	A system-wide approach to treating invasive species should consider habitat restoration as part of the ecological healing process. Helping native species and ecosystems recover is an important step following the removal of harmful species.
Adaptive Management	Land managers or landowners should change course on management prescriptions if treatments are not working. Monitoring the results of control actions is an important part of this process.

ious Weed Strategic Plan (Oregon Department of Agriculture), Oregon Aquatic Nuisance Species Management Plan (Portland State University), Ballast Water Management Administrative Rules (Department of Environmental Quality), Wildlife Integrity Administrative Rules (Oregon Department of Fish and Wildlife).

Other ongoing efforts provide information that would be helpful in addressing invasive species. For example, the Forest Inventory and Analysis (FIA) Program of the U.S. Department of Agriculture (USDA) (<http://fia.fs.fed.us>) uses remote sensing imagery or aerial photography to classify land into forest or non-forest. Permanently established field plots are distributed across the landscape and 10 percent of these plots are visited each year to collect forest ecosystem data. A subset of these plots is sampled yearly to measure forest ecosystem function, condition and health, including measurements of native and non-native plants, which can provide information about the spread of invasive species.

In April 2005, the USDA Forest Service released its Final Environmental Impact Statement "Preventing and Managing Invasive Plants." Although the record of decision has not been finalized, the Forest Service proposed action amends all Forest Plans within the Pacific Northwest Region, Region 6, to improve and increase consistency of invasive plant prevention, and allows the use of an expanded set of invasive plant treatment tools. The Proposed Action includes restoration requirements and an inventory and monitoring plan framework.

GOAL AND ACTIONS

Goal: Prevent new introductions of species with high potential to become invasive, and reduce the scale and spread of priority invasive species infestations.

Actions:

■ Action 2.1. Focus on prevention through collaborative efforts and increased public awareness and reporting

The cost and difficulty of managing invasive species increases substantially once a species has established self-sustaining populations. Once established and widespread, invasive species are virtually impossible to eliminate and control costs can become prohibitive. Therefore, every effort should be made to prevent first-time introductions of invasive species from becoming established in Oregon. By their very nature, however, states' borders are porous and vulnerable to the entry of non-native organisms. A significant challenge is developing and implementing effective prevention strategies based on the best research of where and how new and potentially invasive organisms are likely to enter Oregon.

The Oregon Invasive Species Council (<http://oregon.gov/OISC>) coordinates statewide efforts to prevent biological invasions and seeks to mitigate the ecological, economic and human health impacts of invasive species. Informed Oregonians, landowners, land managers and public officials can take action to further the Council's goals. Businesses, landowners, anglers, hunters, Oregonians and visitors should be reminded of the dangers posed by invasives through targeted outreach and education. People can greatly reduce the accidental introduction or spread of these organisms into and within Oregon if they know which precautions to take. State and federal agencies can work with the Council to promote and raise public awareness of programs for which they have responsibility to reduce or eliminate the risk of introducing invasive species. For example, Oregon Department of Agriculture's noxious weed program provides statewide leadership for coordination and management of state listed noxious weed, and Oregon Department of Fish and Wildlife's wildlife integrity program regulates the importation, possession and transportation of non-native fish and wildlife species. Encouraging Oregonians to report sightings of invaders also is important and can be key to the detection, control and elimination of an invasive species. The Council's toll-free "hotline" is one such tool (1-866-INVADER).

Elected officials, industries and the conservation community should work together to leverage public and private funding to support the efforts of the Invasive Species Council and its partners to develop effective prevention measures. This investment will help protect the economic and ecological interests of all Oregonians, as well as protect Strategy Species and Habitats from the impacts of harmful invaders.

■ Action 2.2. Develop early response mechanisms to facilitate swift containment of new introductions, using site-appropriate tools.

The potential dangers of new invasions to forestlands, agricultural and range lands, natural areas and fish and wildlife should be determined as early as possible so that farmers, ranchers, fish and wildlife managers and conservationists can be warned and are better prepared. One approach would be to form a rapid assessment and response team of state, federal and private experts. Such a team could determine the likely impacts of newly discovered invasive species, predict the spread of new infestations, and decide which steps should be taken to alert the public and bring the problem under control. This approach could do for invasives what interagency fire coordination cen-

ters are established to do for wildfire. Invasive species, like wildfires, ignore ownership boundaries and spread indiscriminately from property to property, underscoring the need to treat invasions wherever they may occur on the landscape. Also like wildfires, invasive infestations are best controlled when small in size. Examples include containment of sudden oak death and control of cordgrass (*Spartina* sp.).

■ **Action 2.3. Establish system to track location, size and status of infestations of priority invasives.**

A number of local, state and federal agencies and private organizations independently gather data on invasive plants, animals and pathogens in Oregon yet the information is decentralized and often not integrated for analysis. The state lacks a comprehensive, coordinated and centralized system for gathering and maintaining data on the location of non-native species on private and public lands. Efforts to institute a reporting system are also hampered in part by landowner privacy and disclosure concerns. Invasive species may not be reported by landowners concerned that disclosure of infestations may lower property values or that they may be held responsible for treatment costs.

There is a critical need to improve the integration and standardization of data on invasive species derived from independent monitoring efforts. Using existing data housed at the Institute for Natural Resources at Oregon State University, a multi-partner, spatially-explicit database and mapping system non-native plants, animals and diseases could be expanded and enhanced. The data would be used to track changes and trends in invasive populations, better anticipate the spread of invasive organisms within the state, identify vectors or points of entry and high-risk environments for invasion, and evaluate the success of management actions. Voluntary infestation reporting by private landowners should be encouraged by providing confidentiality, nondisclosure of sensitive information, and free technical assistance on control methods to increase landowner participation. The web-based information portals discussed on page 102 could be one tool for invasive data reporting and sharing.

■ **Action 2.4. Focus on eradication of invasive species in Strategy Habitats and other high priority areas where there is a clear threat to ecosystems and a high probability of success.**

Some invasives have spread to the point where it would be impractical or impossible to eliminate them from Oregon. Yet

some of these established invasives negatively impact Strategy Species and Habitats and can be contained at the local level. In these situations, control efforts should be focused on those invasives that are limiting factors within Strategy Habitats or to Strategy Species, particularly within Conservation Opportunity Areas. In addition, other priorities may include controlling invasives that disrupt ecological function or impact vulnerable, commercially valuable lands such as rangeland, farmland and timberland.

Local eradication of invasive species near high priority habitats and lands should be emphasized where practical, with the ultimate goal of restoring these lands to their full ecological or utilitarian potential. Controlling established invasives often requires a long-term commitment. If funding runs out or the management priorities change, invasives can quickly return. Restoration can repair habitats degraded by invasive species and may be necessary if aquatic or terrestrial ecosystems are too damaged to heal on their own. Restoration may be the best prescription for inoculating native plant communities against invasive plants because ecosystems are more resilient to invasion when they are healthy and functioning well. Entities involved in invasive species management should encourage landowners to consider ecologically based restoration as part of any plan to manage invasive species.

Private landowners are increasingly partnering with watershed councils, Oregon Department of Fish and Wildlife, Soil and Water Conservation Districts, Oregon Department of Agriculture and federal land management agencies to manage invasive species across property lines. Such broad-scale efforts need to continue and be expanded.

■ **Action 2.5. Work with the Department of Agriculture, the Oregon Invasive Species Council and other partners to develop an invasive species implementation tool that evaluates the ecological impact and management approaches for invasive species identified as priorities in the Conservation Strategy.**

As a first step, Oregon Department of Fish and Wildlife is developing an invasive species implementation tool to further evaluate invasive species identified in this document. Building on already-completed assessments, this tool will rank the severity of ecological impact of each invasive species by analyzing four factors: ecological impact, current distribution and abundance, trends in distribution and abundance, and management

difficulty. This information will be used to determine the best management approaches for individual invasive species. Current and potential partners include The Nature Conservancy, Oregon Natural Heritage Information Center, the Oregon Invasive Species Council, county weed boards, federal land management agencies, Oregon Department of Agriculture and other agencies and organizations

■ **Action 2.6. Develop and test additional techniques to deal with invasives and share information with landowners and land managers.**

Landowners and land managers need to know how to treat invasive organisms that lower the productivity and value of land, alter ecosystem processes and threaten native species. They also need to know what level of investment is appropriate and which techniques are most appropriate for their situations. Throughout Oregon, people are using a variety of methods to control individual invasive species with varying degrees of success.

Multiple site-appropriate control mechanisms (mechanical, chemical and biological) should be evaluated to control individual invasive species. Increased coordination and communication is needed between researchers, agencies, watershed councils and county weed boards and landowners regarding what works under what conditions. In addition, there currently is no known effective way to control some widespread invasive plants such as cheat grass, medusahead, and false brome. Current research needs to be supported and expanded to address these and other invasive species. Outreach materials should be developed to assist landowners and land managers in choosing and using the most appropriate techniques for their sites.

ISSUE 3: Disruption of Disturbance Regimes

Historically, natural disturbance regimes shaped Oregon's landscapes by resetting plant succession, releasing nutrients, moving materials, and creating new habitats. Some ecosystems rely on the natural disturbance regimes for their maintenance. For example, some types of grasslands turn into forests without natural fire.

These natural events have become statewide issues in the past centuries as Oregon's population has grown, placing homes and communities closer to where these disturbances occur. Fires were suppressed to protect valuable timber and towns. The unintended consequences included increased tree density and fuel load of forests, which contributed to insect outbreaks, other forest health issues, and the risk of uncharacteristically severe fires. Dams were constructed to protect towns from flooding, to provide electricity for industries and irrigation for farms. The unintended consequences include loss of floodplain function, loss of fish rearing and spawning areas, and degraded riparian habitats. These changes have all impacted Oregon's fish and wildlife populations. The Conservation Strategy's approach to disturbance regimes is to restore or mimic disturbance regimes to benefit fish and wildlife and reduce risks to people.

GOAL AND ACTIONS

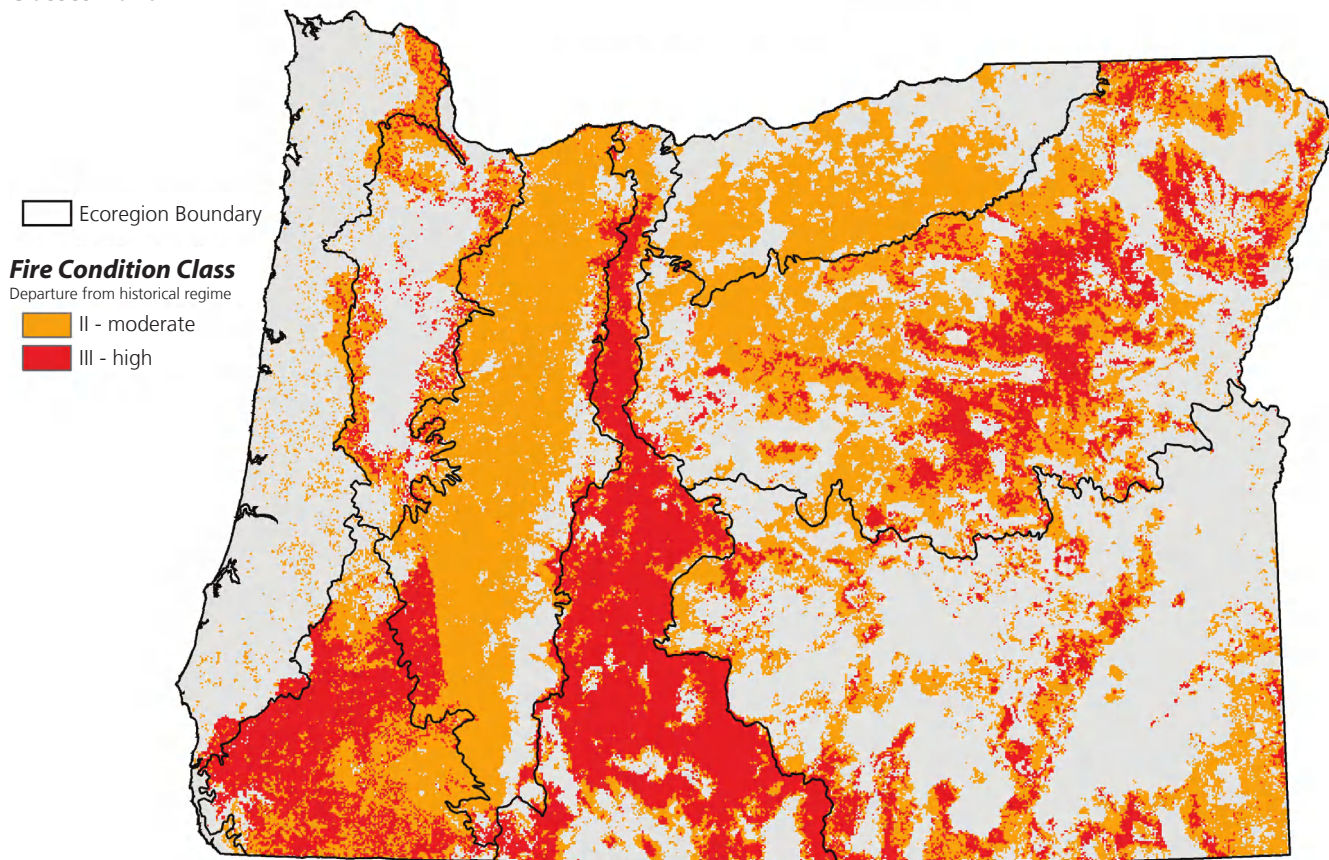
Overall Goals: Restore natural processes such as fire and flood cycles to sustain and enhance habitat functions in a manner compatible with existing land uses. Encourage efforts to increase understanding of historic natural disturbance regimes.

Altered fire regimes:

Fire suppression and uncharacteristically severe wildfire

For thousands of years, fire has been one of the most important forces shaping Oregon's landscapes, both forested and unforested. Whether started by lightning or Native Americans, fire strongly influenced wildlife

Fire Regime Condition Class	Description	Potential Risks
Condition Class I	Within the natural (historical) range of variability of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	Risk of loss of key ecosystem components (e.g., native species, large trees and soil) is low
Condition Class II	Moderate departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	Risk of loss of key ecosystem components (e.g., native species, large trees and soil) is moderate
Condition Class III	High departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	Risk of loss of key ecosystem components (e.g., native species, large trees and soil) is high

Fire Regime Current Condition**Classes II and III**

Data Source: Fire Modeling Institute, Fire Science Laboratory, Missoula, Montana, 2000.

habitats by altering the structure, composition and landscape pattern of native vegetation.

To understand the natural role of fire and how it should be managed, researchers have determined the “natural” (historical) fire regimes for many of Oregon’s habitats. “Natural” fire regimes are classified based on the historic range of fire frequency (the average number of years between fires) and fire severity (the amount of replacement of the dominant overstory vegetation) prior to European settlement. Human intervention over the last hundred years has altered the historic fire regimes in many of Oregon’s landscapes. This has resulted in a cascade of unintended consequences for ecological health, wildlife populations, and people.

Forested landscapes

In forested areas, vegetation changes following fire suppression have increased the likelihood of wildfires that are uncharacteristically large, severe or both. “Fire regime condition classes” are used to describe the amount of departure from natural (historic) fire regimes. The follow-

ing chart contains a simplified description of the fire regime condition classes and associated potential risks to Oregon’s forests.

Nationally-developed maps that display coarse-scale fire regime condition class show over one-third (39 percent) of Oregon’s 27.5 million acres of forestland in Condition Class III and another 45 percent in Condition Class II. Finer-scale fire regime condition class maps are needed statewide to refine these estimates.

The extent of alteration of natural fire regimes varies considerably among forest types. For the purpose of discussing fire, forests typically are grouped into three broad categories:

- Drier forests that are or were dominated by species such as ponderosa pine, Douglas-fir and larch historically tended to experience frequent fires (average intervals between fires of less than 25 years) that burned small trees and shrubs, but had limited effects on overstory trees with thick, fire-resistant bark. This pattern of frequent, low-severity fires is often referred to as an understory fire regime.

- Forest in moist, cold areas (or at least with cool summers, as in the Coast Range or high elevations in the mountains) tended to experience infrequent fires (average intervals of more than 100 years) that killed most or all of the dominant trees, leading to a stand-replacement fire regime.
- Intermediate environments such as mid-elevation areas supporting forests comprised of a variety of conifer species had average fire return intervals ranging from around 25 to 100 years. The impact of fire on overstory trees could vary from minimal to severe (depending largely on weather and topography). This associated fire regime is often referred to as a mixed fire regime.

The greatest extent of alteration to natural fire regimes has occurred in forests that historically had an understory fire regime. These forests are ponderosa pine and some mixed conifer forest types in the East Cascades, Blue Mountains, and eastern (interior) portion of Klamath Mountains ecoregion. Human intervention, particularly fire suppression and past selective logging of large overstory trees, has shifted the historic fire regime from an understory fire regime with frequent, low-intensity fires to a stand-replacing fire regime with less frequent, high intensity fires.

Fire suppression (particularly on federal lands) eliminated the frequent, low-intensity fires that historically occurred in these forests. The elimination of frequent, low-intensity fires resulted in increased fuel loads in the form of surface fuels, shrubs and smaller trees and increased stand densities. Increased stand densities favored shade-tolerant understory trees like Douglas-fir and grand fir. Dense understory trees served as “ladder fuels” that linked surface fuel and overstory fuels. Selective logging removed the larger, more fire-tolerant trees and opened the canopy, allowing more small fire-sensitive trees to grow in the understory. The increase in fuel loads and stand densities made it more likely that when fire did occur it would reach the forest canopy and spread as a crown fire. As a result of increased stand densities, larger trees became stressed due to competition with other vegetation for water and became more prone to insect infestation and disease.

Because of their large size and intensity, uncharacteristic fires are more likely to cause adverse economic and environmental impacts. Fire has a negative economic impact on rural communities in Oregon whose economy and culture are based on forestry. Fire-fighting activities are a major expense for the state as a whole. In 2002, Oregon spent approximately \$47 million on fire suppression efforts.

Uncharacteristically severe wildfire also poses higher risks to species and habitat because such fires can involve large areas and often result in complete mortality of overstory and understory vegetation (stand-

replacing events). These stand-replacing fires can impact habitats, soils and watersheds beyond their adaptive limits. Uncharacteristically severe wildfire impacts aquatic habitat by removing riparian vegetation, which results in higher stream temperatures, decreased bank stability, and increased sedimentation in stream channels.

Many Oregon forests in fire regime Condition Class II or III contain Strategy Habitats or other important habitats for Strategy Species. Many of the Late Successional Reserves (LSRs) designated under the Northwest Forest Plan for management to preserve and produce late-successional forests are located in Condition Class II or III forests. These LSRs address the habitat needs of late-successional and old-growth forest related species, such as northern spotted owl or marbled murrelets. Many riparian areas that provide habitat for fish species listed under the Endangered Species Act (ESA), including steelhead, chinook salmon, coho salmon and bull trout also are located in forests in Condition Class II or III. Forests in Condition Class II or III also include many ponderosa pine forests in central and eastern Oregon.

Unforested habitats

Historically, many of Oregon’s open structured habitats – those dominated by grasses, forbs, and/or shrubs – were maintained by disturbance. Primarily the disturbance was fire, but also included flooding, wind, storms, and salt spray. In many areas, Native Americans set fire to favor plants with edible bulbs, improve travel, manage for big game, and hunt. Lightning also had a role in historic fire regimes. Altered fire regimes have resulted in vegetation changes in these habitats, affecting wildlife dependent on open landscapes.

Fire historically maintained many grasslands, aspen woodlands, oak woodlands and savannas, and sagebrush steppe habitats by removing competing vegetation and stimulating regeneration of native fire-associated plants. Fire suppression has allowed shrubs and conifers to encroach into grasslands, oak woodlands, and oak savannas. Similarly, it has allowed western juniper to encroach into aspen clones, some riparian areas, and mountain big sagebrush habitats. Maintenance of these habitats over time will require the careful reintroduction of natural fire regimes using site-appropriate prescriptions (accounting for the area size and vegetation characteristics that affect resiliency and resistance to disturbance). In some areas, other techniques such as mowing or controlled grazing can be used to mimic the effects of fire.

The issues of altered fire regimes and invasives species interact to create unnatural fire cycles in eastern Oregon, particularly in the Northern Basin and Range ecoregion. The introduction of invasive annuals, particularly cheatgrass and medusahead, can increase the frequency, intensity, and spread of fires. Breaking this cycle will require proactive

management to prevent introduction of annual invasives, minimizing the spread of cheatgrass, controlling wildfires in invasive-dominated areas, avoiding prescribed fire in cheatgrass-dominated areas, and conducting research on how to better restore areas dominated by invasives.

GOALS AND ACTIONS

Goal: Reduce uncharacteristically severe wildfire and restore fire or use site-appropriate techniques that mimic effects of fire in fire-dependant ecosystems.

Actions:

- **Action 3.1. Use wildfire risk classification maps to identify local zones with greatest risk of uncharacteristically severe wildfire and prioritize for further action.**

Coarse-scale fire condition maps have been developed for Oregon, but further work is needed to determine wildfire risk at finer scales. Specifically, refinement is needed to verify whether site-specific conditions are actually in Condition Class I, II, or III. These maps can then be used to prioritize which local sites need management actions to reduce risks.

Setting priorities is essential, due to the magnitude of the areas requiring restoration and the limited resources allocated to their treatment. The risk of losing key ecosystem components is a factor that should be considered, with priority given to areas that currently are in fire regime Condition Class III (high risk of losing key ecosystem components) or Class II (moderate risk of losing key ecosystem components).

In identifying priorities for fuel reduction techniques, consideration should be given to both local site-specific conditions and the broader landscape context. Site-specific considerations should include identification of particular values at risk of loss from uncharacteristically severe wildfire, such as remnant large-diameter ponderosa pine. Larger-scale considerations should include factors such as the extent to which an area's landscape context makes it highly valuable to wildlife (travel corridors, calving grounds, wintering area, etc.) or more likely to be vulnerable to fire or contribute to fire spread. Similarly, proximity to human residences or high-value watersheds needs to be considered.

- **Action 3.2. Collaborate with landowners and other partners in these zones to lower risk of wildfires while maintaining wildlife habitat values, and to choose the sites and landscapes for fuel reduction.**

Site-by-site decisions must be made on the type and extent of fuel reduction treatments that will be conducted. Fuel reduction treatments must be balanced in relation to other ecological objectives. Oregon forests in fire regime Condition Class II or III contain Strategy Habitats that provide habitat for a number of Strategy Species, including species listed under the Endangered Species Act. If fuel reduction treatments are not undertaken, the long-term risk of losing key ecosystem components to uncharacteristic fire is increased. However, fuel reduction treatments can impact species and habitat by disturbing soil or eliminating key habitat components (such as canopy cover, hiding cover, snags, large woody debris or large live trees). These impacts will vary depending on the extent, pattern and level of fuel reduction treatments. Decisions on the fuel reduction treatments must balance the need to maintain these key ecosystem components with management needed to reduce risk of long-term damage to wildlife from wildfires.

In high priority zones, use active management techniques to reduce surface, understory and crown fuels. Fuel reduction treatments typically involve mechanical treatments followed by the use of prescribed fire, if appropriate. The most common mechanical treatment is the removal of smaller trees by understory thinning or thinning from below, although other forms of thinning may be employed, as well as mowing and crushing to reduce shrubs and surface fuels. Maintenance treatments will be essential to maintaining desired conditions and successional trajectories. Maintenance of areas in Condition Class I, especially in dry forest types, will also be important. In the absence of maintenance, areas currently in Condition Class I and II will continue to progress into Condition Class III.

- **Action 3.3. Seek and support cost-effective methods for reducing fuels, especially innovative approaches that contribute to local economies.**

In some areas, carefully removing understory biomass can restore habitats with historically open understories while reducing the risk of uncharacteristically severe wildfire by reducing fuel loads and removing ladder fuels. Developing markets for these small-diameter trees can create jobs, contribute to local economies, and help pay for restoration. The U.S. Forest Service's Stewardship Contracting program offers opportunities to implement and fund certain habitat restoration and management projects. Currently in Oregon there are several innovative projects to develop markets for small-diameter trees. Two of these collaborative efforts are featured in this document:

Community Smallwood Solutions (page 284) and the Lakeview Biomass Project (page 214).

Social acceptance for fuel management and other wildfire reduction efforts is likely to be greatest where various interests and values converge, for instance in an accessible area of dry forest types where restoration would protect residences, restore or conserve habitats of concern, and provide a commercially valuable timber by-product that could be processed in a local mill. Given the great disparity between the extent of areas needing treatment and the limited resources to accomplish necessary treatments, careful consideration of factors related to social acceptance, as well as fire risk and other ecological elements, should help identify areas where projects can both provide substantial benefits and have a high likelihood of being successfully implemented. Thus, collaborative approaches to prioritizing and planning fuel reduction must include diverse public interests. Collaboration between federal land management agencies and a variety of Oregonians, groups and agencies are required for projects undertaken through the Healthy Forest Restoration Act and Stewardship Contracting. Furthermore, the monitoring of fuel reduction techniques discussed above is essential for both refining techniques and building trust and confidence among stakeholders.

A recent book by respected Montana restoration researchers and practitioners Stephen Arno and Carl Fiedler provides both a more complete treatment of the principles discussed above, and many examples of what those authors consider successful forest restoration in different forest types on a variety of land ownerships. Their examples from Oregon include efforts in Wallowa County and central Oregon (US Forest Service, Sisters Ranger District).

- **Action 3.4. Using site-appropriate prescriptions, carefully reintroduce natural fire regimes as part of an overall wildfire risk reduction and habitat restoration program in locations where conflicts such as smoke and safety concerns can be minimized.**

Forested Landscapes

Because of high fuel loads in many areas, the most typical scenario will involve mechanical treatments followed by fire. Prescribed fire typically will involve intentional human ignitions, but strategic use of lightning-caused fires also can be benefi-

cial under well-defined conditions. A program of active fire suppression will continue to be a necessary part of an overall fire-management strategy to protect local communities and private property.

Management actions such as active thinning and prescribed burning in at-risk green stands should eventually reduce the amount of effort and funding needed for fire suppression in those areas. As discussed previously, active maintenance may be needed in some areas. However, the overall goal should be the restoration of conditions where natural fire can perform its historic ecological role across more of the landscape and where compatible with existing land uses. Planning for wildfire risk reduction and habitat restoration should evaluate if it would be feasible, ecologically appropriate and socially desirable to allow the historic fire regime to return once high fuel loads are addressed.

Unforested habitats

Prescribed fire can be a useful tool when tailored to local conditions. However, prescribed fire is not necessarily suitable for all situations. In the Northern Basin and Range and Blue Mountain ecoregions, low productivity communities are extremely slow to recover from disturbance such as prescribed fire. For example, low sagebrush communities have poor, shallow soils and are slow (150-300 years) to recover from significant soil disturbance or fire. Inappropriately managed fire, either prescribed fire or wildfire, can increase dominance by invasive plants. In the Klamath Mountains and Willamette Valley, prescribed fire poses challenges such as conflicts with surrounding land use, smoke management and air quality, and public safety. In the Coast Range, prescribed fire is difficult due to high precipitation and wet conditions. When conditions are dry enough to use prescribed fire in coastal grasslands, there are usually concerns with risk to surrounding forests.

To address these issues, carefully evaluate individual sites to determine if prescribed fire is appropriate. Be particularly cautious in low productivity sites where recovery times are prolonged or in sites with invasive annual grasses. If determined to be ecologically beneficial, reintroduce natural fire regimes using site-appropriate prescriptions and considering conflicts such as smoke and safety concerns. If prescribed fire is not appropriate or feasible, consider alternative methods that mimic the effects of fire (see Action 3.5).

- **Action 3.5. Use site-appropriate tools such as mowing, brush removal, tree cutting, and controlled grazing to mimic effects of fire in fire-dependent habitats.**

Use multiple site-appropriate tools to maintain open structure habitats. These may include mowing, controlled grazing, hand-removal of encroaching shrubs and trees, or thinning. For all tools, minimize ground disturbance and impacts to native species. Use mechanical treatment methods (e.g., chipping, cutting for firewood) to control encroaching conifers. In aspen habitats, reintroducing a disturbance regime may be necessary to reinvigorate aspen reproduction after mechanical removal of conifers. In areas where western junipers are expanding into sagebrush habitats, maintain older juniper trees, which are very important for wildlife.

- **Action 3.6. Develop tools that evaluate trade-offs between short term loss of wildlife habitat values and long term damage to habitat from wildfires. And,**
- **Action 3.7. Evaluate effects of forest management practices that reduce wildfire risk to wildlife habitat values.**

Efforts to reduce wildfire risk and restore habitats need to occur within an adaptive management framework in which actions are monitored and modified in response to results and changing conditions.

In some cases, wildlife habitat elements such as hiding cover and snags will be reduced by fuel reduction activities. However, not taking any action could result in complete habitat loss through severe wildfire. Thus, analytical tools are needed to evaluate and compare the short-term risk of fuel reduction treatments to species and habitats against the long-term risk to species and habitats posed by uncharacteristically severe wildfire. Such tools would assist landowners and land managers in determining appropriate actions for individual sites.

Fuel reduction techniques need to be monitored to determine the short-term impacts of fuel reduction techniques on species and habitat, and the long-term effectiveness of fuel reduction techniques in reducing the risk of uncharacteristic fire. Furthermore, research is needed to better understand the effects of historic fire regimes, severe wildfire and fire suppression on wildlife. Also, historic disturbance regimes are not well-understood for all habitat types, so research is needed to determine

the historic frequency and severity of disturbance that maintained Strategy Habitats. Formulate management approaches, including use of prescribed fire, accordingly.

Floodplain function

The natural cycle of flooding has changed

From time to time Oregon's waterways, filled by rains and snowmelt, overflow their banks and spread across the landscape. Minor floods occur relatively frequently and on most Oregon streams at one time or another. Many streams flood once or more each season. Flooding occurs under different circumstances on the west side of the Cascades than on the east side. Floods on rivers in eastern Oregon are more often the result of spring snowmelt. The central and eastern areas of the state are also subject to summer thunderstorms that drop large amounts of rain in short periods, overwhelming the soil's capacity to absorb the moisture and river systems to transport it. Flash floods result. In western Oregon, winter storms and spring rain-on-snow events contribute to seasonal flooding.

The area of land adjacent to the river that absorbs overflow during floods is the river's floodplain. Rivers often carve new courses during floods. Over time and left to their own ways, rivers move across the landscape creating oxbows and excavating new channels and alcoves. This makes naturally flowing rivers rich habitat for aquatic species and floodplains fertile habitat for terrestrial species.

A River Changes - Story of the Willamette

The Willamette River is a good illustration of how people can change a river and its associated habitats. Although changes have been most dramatic for the Willamette River, this story applies to many of Oregon's streams and rivers.

The Willamette River Basin captures precipitation from the many Pacific Ocean storms that march onshore each winter. This makes the Willamette the 13th largest river by stream flow in the United States, yet it produces more runoff per unit of land area than any of the larger 12 rivers.

Prior to European American settlement, the upper, southern third of the river from today's Eugene to Albany, occupied a wide swath of the valley bottom in a braided network of side channels and wetlands, seven miles wide in places. The middle reach, from today's Albany to Newberg, while constrained by the Salem Hills, meandered across the landscape and seasonally flooded adjacent lowlands. Wide floodplain forests of black cottonwoods, red alder, Oregon ash, big leaf maples

and willows surrounded many of the tributaries as well as the main stem and during large floods, the river expanded into this broad floodplain.

The regular flooding of the valley bottom deposited silt and nutrients from upstream that over time built exceptional agricultural soils and fertile floodplain habitat. The rich soils and abundant rainfall attracted immigrants intent on farming the valley bottoms. The floodplain's proximity to river transportation made these areas all the more appealing. Thus, the Willamette floodplain was one of the first and surely the most completely settled, cultivated and altered of the basin ecosystems.

As settlements grew along the river, floods became a greater threat to life and property. River transportation had also become an essential component of pioneer life. To prevent floods, stop river erosion and improve navigation, the river was significantly altered. Dams were built, and banks were hardened with riprap. The floodplain forests were logged and the land along the river was drained and cultivated. The many braided and shallow channels were filled or merged in to one navigation channel. As a result, there are currently 96 miles of revetments on the Willamette River, most on river bends. Thus the most dynamic sections of the river's course are armored and static, greatly diminishing its capacity to cool, flush out sediment, and accommodate floods.

The riparian forests, wetlands and grasslands that lined the historic 11,000 miles of rivers and streams in the basin provided critical habitat for aquatic and terrestrial species. This habitat has been reduced in scale and value. Studies repeatedly point to the floodplain as the most critical focus of restoration to benefit aquatic, riparian and upland species.

History of modification to Oregon's river systems: dams and channelization

Oregon's first dams were built in the late 1800s to supply electricity to cities. Many "splash dams" were built to transport logs from forest to mill, but they did so much damage to streams they were outlawed in 1958. Major dam building took place between the turn of the last century and the 1960s. Initially the federal government built dams to provide irrigation water to farmers. The first of these projects in Oregon under the 1902 Reclamation Act, and managed by the Bureau of Reclamation, was the Klamath Project, a complex of dams and canals that drained extensive wetlands and diverted lake water to irrigate 225,000 acres of former rangeland. By 1940, over 70 percent of Oregon's current water storage capacity was in place behind eight Bureau of Reclamation dams. While many of these dams may provide a variety of services, flood prevention was not their primary purpose.

As human settlements grew along rivers, buildings, towns and farms were subject to damage by floods as well as erosion from meandering river systems. Dams increasingly became important for flood control. The Flood Control Act of 1936 declared that flood prevention was in the public interest and thus was a responsibility of the federal government. The U.S. Army Corps of Engineers currently operates 20 dams in Oregon, 11 of them west of the Cascades. Those constructed on the Columbia (Bonneville, The Dalles and McNary) were built to generate electricity, rather than provide storage. Today, the greater percentage of dams across the state is operated by cities, local districts or individual landowners for a variety of purposes including flood control. There are 1,100 dams in Oregon that are at least 25 feet high.

In addition to dams, rivers have been modified in a number of other ways. Rivers have been dredged and deepened to improve their use for transportation, flood control, and irrigation needs, as well as to increase the area available for agriculture. Large stone riprap, levees and deflectors harden and stabilize banks and redirect river flow to prevent erosion and channel movement. These structures constrain rivers to a single course, disconnecting them from their floodplains.

Effects on river dynamics, floodplain function and fish and wildlife habitats

While dams and revetments provide valuable services to human communities, they alter river dynamics that affect aquatic and terrestrial communities in significant ways. Floods on wild rivers provide a number of important natural services, renew floodplain soils and aquatic habitat, and are part of the normal pattern of disturbances that shape Oregon ecosystems.

The loss of a river or a stream's connection to its floodplain reduces its ability to absorb floodwaters. When small streams and creeks reach flood stage and overflow onto adjacent lands the pulse of floodwater slows before reaching larger rivers. The speed and severity of modern floods worsens with the loss of this floodplain "sponge effect." In developed areas, modifications have been made throughout river and stream systems. Paved surfaces allow no infiltration into the ground but instead concentrate stormwater into pipes and directly into streams. In rural areas, agricultural ditches move water off the land briskly. Across Oregon, rivers have been channelized. As a result, floodwaters barrel downstream overwhelming the larger rivers instead of spreading across the landscape and gradually infiltrating or evaporating.

Floods move gravel from uplands to bottomlands. Clean gravel is an essential streambed surface for healthy salmon spawning beds. Side channels created by freshly deposited gravel bars provide sheltered

settings outside the strong main river current where young fish and other small aquatic creatures can rest or feed. Water gets cooler when it flows through gravel and changes chemistry, improving conditions for coldwater anadromous species. Unfortunately, dams trap gravel and constrain major floods that would normally move gravel downstream. They also trap silt. Conversely, channelization can contribute to greater streambank scouring and erosion because stream complexity (bends, pools, eddies) have been removed, thereby destabilizing the banks and interfering with the historic pattern of flood-based gravel transport and disposition. Since natural river channels are maintained by a dynamic equilibrium between erosion and deposition of silt, water moving without silt or through straightened channels can cause riverbed erosion.

In natural systems, large floods send logs tumbling into mountain streams and topple trees along riverbanks. The force of floodwater moves submerged logs into new locations. These actions rearrange the river habitat, flushing out sediment and setting up new complex structures necessary for healthy aquatic habitat. Dams temper the force of floodwaters, diminishing the power of streams and rivers to move large wood, thus depriving streams of new structure. Channelization removes the complexity of existing stream structure and straightens and speeds flows, thereby depriving streams of potential locations for large wood debris recruitment and retention.

Water temperature cycles are altered by impounding water behind dams, with resulting disruption of temperature-dependant life cycles of anadromous fish and their food sources. Water in a stream is mixed and full of nutrients and oxygen. Water held behind dams warms in the summer sun. The surface temperatures rise while cold water sinks and suspended material settles to the bottom. Phytoplankton – single celled plants that make up the base of the food chain – proliferate at the top, releasing oxygen. When they die, they sink to the bottom where bacteria consume them and use oxygen. Over the course of the summer, the water at the top of a reservoir is warm and full of oxygen and food. The water at the bottom is cold and low in organic matter and oxygen. This is significant for fish because their life cycles and those of their food sources are triggered by temperature. Dam releases can be controlled to maintain appropriate temperatures for fish. Aquatic insects require a series of temperature cues to produce eggs, hatch, and develop into nymphs. Over time, dammed rivers behave more like lake ecosystems, losing their capacity to support riverine fish species.

The flood prevention modifications also have affected river floodplain habitats. Floods that used to occur every 10 years or so now occur every 100 years or more. Former floodplains no longer receive regular deposits of waterborne sediment. Disconnected from their rivers and drained,

they no longer provide wetland and seasonally flooded habitats. In addition, annual high-flow events have become “flashy” (shorter in duration and greater in intensity) in some areas where there has been extensive channelization and loss of floodplain function.

Development intensifies the loss of floodplain habitat on floodplain function. Rather than being absorbed by the ground, water drains off of impervious surfaces into waterways, which can increase stream and river water levels and cause downstream flooding.

GOAL AND ACTIONS

Goal: Maintain and, where feasible, restore floodplain functions such as aquifer recharge, water quality improvements, soil moistening, natural nutrient and sediment movements, animal and seed dispersal, gravel transport and recruitment, and habitat variation.

Actions:

- **Action 3.8. Restore floodplain function by: reconnecting rivers and streams to their floodplains, restoring stream channel location and complexity, removing dikes and re-vetments, allowing seasonal flooding, restoring wetland and riparian habitats, and/or removing priority high-risk structures within floodplains.**

Maintain functional floodplains and riparian systems. Work with local communities, watershed councils, landowners, and other partners to restore and reconnect natural stream channels and floodplains in rural areas. Explore opportunities for broad scale floodplain restoration on main rivers and their tributaries. The greatest benefits will be achieved where this can be done on large scales. While restoration of entire rivers may not be feasible, seek opportunities to restore critical main-stem or tributary habitats, floodplain function and critical off-channel habitats adjacent to the main channels. Use subbasin plans and similar efforts for key information on floodplain issues and opportunities.

Reduce head-cutting of streams resulting from storm water discharges by replacing culverts that are not at stream grade, reducing run-off to streams, and replanting and encouraging planting streambank and riverbanks with native vegetation. When re-development is planned, explore opportunities to remove structures or pavement from floodplains and restore native vegetation.

■ **Action 3.9. Work with power companies, agencies, irrigation districts and municipalities to time water releases to replicate natural flood cycles.**

Restore or replicate natural timing where feasible. Work with power companies and municipalities to develop a schedule of releases timed to replicate natural flood cycles, while continuing to provide essential hydroelectric power and water storage services.

■ **Action 3.10. Identify and restore important off-channel habitats and oxbows cut-off by previous channel modification.**

While revetments protect riverside property, they simplify or eliminate the side channels, alcoves and islands that provide essential complex habitat structure for aquatic species. These are critical areas for juvenile salmonids and some amphibians. Reconnect these habitats to rivers where feasible. Use bio-engineering instead of rip-rap on bank stabilization projects.

ISSUE 4: Barriers to Animal Movement: Aquatic Passage and Terrestrial Corridors

Nature is full of cycles that influence fish and wildlife behavior. One of the most dramatic and yet not fully recognized is how wildlife move across the landscape. These movements or migrations happen at different scales. Salmon migrate from mountain streams to the ocean and back to complete a life cycle. Tiny hummingbirds spend winters in Central America, and return to Oregon each spring to nest. Some hummingbirds travel as far north as Alaska to breed – a journey of thousands of miles for an animal that weighs less than a penny. Deer and elk move to higher elevations in spring to raise their young, and move to lower elevations in winter, where weather is milder and food more accessible. Turtles move a few hundred yards or even a few miles in search of a place to lay eggs. Bears will return each year to the same huckleberry patch, to feast on the ripe berries. Migrating waterfowl and shorebirds stop to rest and feed on their long journey north at the same wetlands, mud flats and lakes every year.

As people build structures and alter habitats, the risks to fish and wildlife increase as they encounter barriers, people, vehicles and loss of habitat. These changes in the landscape and vegetation are often difficult adjustments for fish and wildlife, and can affect survival of individual animals and entire populations.

Aquatic passage

Even before Oregon was officially recognized as a state, natural

resource managers were concerned with providing stream passage for migratory fish. Barriers such as dams, dikes, road fills and culverts change hydrological conditions and alter natural flow regimes. Many of these artificial obstructions create a drastic change in water surface elevation from one side of the structure to the other. Misaligned culverts that have the downstream end above the water level disconnect stream passage corridors, prevent fish passage and force wildlife to cross roads where they are vulnerable to vehicles and predators. Under-sized or improperly sized culverts alter transport of sediment and wood, creating an uneven distribution of habitat.

Suitable passage should be provided for native migratory fish past artificial obstructions allowing movement both upstream and downstream. As the state agency responsible for sustaining healthy fish populations, Oregon Department of Fish and Wildlife works with owners or operators in several ways to address passage. Recognizing the unique nature of migratory fish in the Pacific Northwest, many other agencies and groups are also interested in ensuring fish passage.

An additional aspect of fish passage is fish screening, which is another important part of the Oregon Plan aimed at the protection, restoration, and recovery of native migratory fish, most specifically salmon and steelhead. Screening efforts go toward reducing juvenile fish mortality at water diversions (e.g., irrigation systems, hydropower systems) by placing screens and by-pass facilities that meet the most recent regulatory criteria to prevent fish from moving with diverted water into locations which are detrimental to their survival. This aspect of downstream passage assures that fish stay within natural waterways and are not harmed by anthropogenic water uses.

Terrestrial corridors

People sometimes think that wildlife occupy the same patch of habitat all their lives. However, wildlife often move through the landscape for a variety of reasons. Some species move seasonally, following food resources. Or, they may move to areas more suitable for laying eggs, raising young or surviving the winter. Other species may move at a more local scale, adjusting their habitat use during parts of the day. For example, wildlife may move to a riparian area for drinking, shade or cover from predators. Still others move through their home range, “patrolling” and marking the boundaries to protect their territory.

Human-caused changes to the landscape can affect the ability of wildlife to move across terrestrial landscapes by adding obstacles, impacting stopover sites, and increasing habitat fragmentation.

Buildings, roads, and other structures can serve as obstacles. Migration is a strong urge in species, and migration routes are often used

over decades or centuries, by generations of wildlife. So, when a new obstacle pops up in the route, like a roadway or a housing development, wildlife may try to find a way through the area, rather than avoid it. This can lead to increased mortality to wildlife on highways and can endanger human safety as well. In residential and urban areas, they are moving through an open landscape of lawns and backyards. Barking dogs and free-roaming cats, lights from houses, security lighting and street lights, vehicle traffic and other features people take for granted can be frightening or even lethal to wildlife. Some wildlife species are not welcome in developed areas, and human-wildlife conflicts result. In rural areas, the impacts of roads on wildlife movement will depend on the type of road and the level of use, with impacts increasing with the amount of traffic.

Some wildlife, especially birds, need staging or stopover areas to rest and refuel during migrations. Habitat conversion or degradation can impact important staging or stopover sites, thus impacting the animals that depend on the sites. Lastly, habitat fragmentation can be a barrier to animal movement for species that require continuous habitat, particularly less mobile ones that cannot fly or swim between habitat patches.

How these barriers affect wildlife depends greatly on the species, the habitat type, the landscape context, and the type of barrier. For example, a two-lane highway may pose an insignificant barrier to elk, but may be impossible for a turtle to cross.

These issues can be addressed through careful planning of transportation facilities and other structures, site-appropriate road management, providing road crossings, maintaining and restoring stopover sites, and addressing habitat connectivity.

GOAL AND ACTIONS

Goal: Provide conditions suitable for natural movement of animals across the landscape

Actions:

- **Action 4.1. Continue working with Oregon Watershed Enhancement Board, Oregon Department of Transportation, U.S. Forest Service, U.S. Bureau of Land Management, and other partners to inventory, prioritize and remove fish passage barriers, leveraging current work done by Oregon Department of Fish and Wildlife's Fish Passage Task Force to expand implementation of fish passage priorities.**

Time, effort and money could be spent more efficiently if fish passage efforts were clearly prioritized and projects were implemented based on the priorities. In some cases, passage is provided upstream from significant barriers. Given the expense and challenges of this work and the vast number of sites to address, it is critical to work collaboratively and strategically.

A barriers database currently under development by Oregon Department of Fish and Wildlife, Oregon Watershed Enhancement Board and many other partners presents a good opportunity to fully evaluate barriers across Oregon. To meet statutory requirements and to address the need for prioritizing artificial obstructions, Oregon Department of Fish and Wildlife is seeking funds to complete a statewide inventory of artificial obstructions. The inventory will list information sources held by many different entities. In addition, Oregon Department of Fish and Wildlife already maintains inventories of larger dams and state- and county-owned culverts.

Oregon Department of Fish and Wildlife Fish Passage Task Force

In 2000, a multi-stakeholder group, including state and federal agencies, the Association of Oregon Counties, the League of Oregon Cities, the Oregon Association of Water Utilities and the Water Utility Council, the Oregon Farm Bureau, and other natural resource use and conservation groups, convened to draft legislation designed to focus and combine existing statutes on aquatic passage. The resulting legislation, passed in 2001, requires the owner of an artificial obstruction located in waters where native or migratory fish were currently or historically present to address fish passage. The legislation ensures benefits for native migratory fish while providing flexibility for owner-operators by allowing the Fish and Wildlife Commission to consider circumstances

in which passage requirements would not need to be provided at an artificial obstruction. These circumstances may include lack of benefit to fish passage, or, an alternative to passage that will provide an overall net benefit to fish, such as increasing habitat quality or quantity within the same basin as the obstruction. The 2001 statute also established a citizen Fish Passage Task Force that currently advises Oregon Department of Fish and Wildlife in matters related to fish passage, including large expenditures from the cost share grant program, new fish passage administrative rules, and waivers and exemptions from providing fish passage.

Oregon Department of Fish and Wildlife also is developing a systematic method to prioritize artificial obstructions based on their value to native migratory fish. This prioritization method will allow artificial obstructions to be ranked and guide agency efforts at improving fish passage. It will be available to others (e.g., watershed councils, counties, Oregon Watershed Enhancement Board) to guide their fish passage work or funding. Oregon Department of Fish and Wildlife intends to provide information and analysis tools via an interactive website. The analysis tools, which will help prioritize structures, will incorporate maps of habitat quality derived from Oregon Department of Environmental Quality information [303(d) list] and fish distribution data. Currently Oregon Department of Fish and Wildlife is seeking funding from the Oregon Watershed Enhancement Board to implement this inventory and prioritization project.

■ **Action 4.2. Maintain and restore habitat to ensure aquatic connectivity and terrestrial corridors in priority areas, such as Conservation Opportunity Areas and urban centers.**

Aquatic passage

Of all artificial obstructions that affect aquatic systems, road-stream crossing structures (culverts and bridges) are the most numerous. Many culverts have been placed with the primary goal of moving water past the structure efficiently (rather than impounding it, such as occurs with a dam), without considering the additional goal of ensuring the continuity of stream function across the obstruction so as to provide fish and wildlife access and habitat through and/or within the culvert.

Road-stream crossing structures, including habitat improvement projects or mitigation, should be designed and built with the goal of maintaining natural flow and hydrological regimes. This goal will ensure the best conditions for both fish and wildlife (macroinvertebrate and amphibian) passage. Flow and passage should be maintained as historically available through restoration of aquatic habitat connectivity.

Prioritize these efforts based on benefits to aquatic species and location within priority areas, including Conservation Opportunity Areas and urban centers. Use ongoing work on the aquatic barriers database to identify high priority habitat for restoration.

In some situations, coordination among responsible parties and interested partners is required to address the effects of obstructions on the hydrological regime. Coordinating with multiple

owners, multiple regulatory levels, and across jurisdictional boundaries, such as with railroads and some hydroelectric projects, can take much more time and negotiation to reach an acceptable outcome, but is critical to long-term success.

Fish passage structures, such as fishways and culverts, must be properly designed. If implemented improperly, these structures will not provide adequate fish passage and can actually become barriers themselves, creating frustration for landowners and land managers.

Oregon Department of Fish and Wildlife has existing criteria and guidelines, which are currently undergoing revision. The National Marine Fisheries Service has criteria and guidelines for fish passage. Agency biologists, consultants, owners and operators of artificial obstructions, and other regulatory entities must be aware of and understand the procedures, criteria, and guidelines in order to assure that the best possible passage and stream function are being provided.

Providing fish passage with a fish ladder or properly sized culvert or bridge is an added expense to the owner or operator of an artificial obstruction. However, there are several financial incentive programs that can be of assistance. Oregon Department of Fish and Wildlife has a cost share grant program to help with these costs. There also is a small tax credit allowed in statute if a fish screening or passage structure is installed. Identifying additional funding sources would be greatly beneficial, as passage projects can be quite expensive.

Terrestrial corridors

When new transportation facility development is proposed, assess the use of an area by fish and wildlife, and look for important crossings and corridors. Leave habitat corridors intact where possible, and if not, provide alternative connecting habitat nearby. If redevelopment opportunities arise in older developments, provide greenways for wildlife in or adjacent to the area. Work with community leaders, planners, and agency partners to identify wildlife movement corridors and to fund and implement site-appropriate mitigation measures such as drift fences to underpasses in priority areas.

When evaluating animal movements, consider avian, subterranean (underground), and sub-nivean (under snow) movements. Some of these might be important to consider when planning wind energy, communications tower, gas pipeline, and other forms of development.

Riparian areas are important corridors, and many species of wildlife use them to move through the landscape. Maintain the riparian areas whenever possible, and plant them with native plants, to provide food and cover. Other less obvious corridors, such as powerline right-of-ways, can play a role, especially in urban areas. Corridors may not be appropriate in all cases, so explore other options for providing connectivity. For example, improve connectivity through habitat restoration by enlarging habitat patches and creating links between isolated habitat patches.

In forested areas, minimize the effects of roads on animal movement by maintaining vegetation to provide screening along open roads, prioritizing roads for closure based on transportation needs and wildlife goals, and/or managing road use during critical periods.

■ **Action 4.3. When planning aquatic passage projects, consider the needs of other aquatic species and terrestrial wildlife, as well as fish.**

Most efforts to address aquatic passage have emphasized fish, particularly salmonids, to the exclusion of other types of aquatic life. Some aquatic species may have specific passage needs. For example, the Columbia River Lamprey Technical Workgroup wrote a report on passage considerations for lamprey, which identifies research needs related to lamprey passage. Ensuring fish passage can provide benefits to a broad array of species. Although there are currently no requirements to ensure passage for wildlife, ongoing efforts to replace culverts present opportunities for developing, testing and implementing methods to maximize benefit for a variety of species. Aquatic invertebrates would benefit from making culverts as wide as possible to allow lateral movement of the stream and from keeping the bottoms of culverts at least eight inches below the surface of the stream's substrate. Amphibians benefit from natural substrates. In addition, maintain and restore riparian habitat to provide wildlife passage adjacent to in-water habitats.

■ **Action 4.4. Continue to screen ditch and pump water diversions to protect fish using funds from Oregon's Fish Screening and Passage Cost Sharing Program and work with state and federal funding partners.**

Barriers are frequently associated with irrigation, municipal, industrial and hydroelectric water diversions that cause fish loss

in the millions. Continue to provide fish screens at water diversions to keep fish in their natural streams and lakes.

■ **Action 4.5. Work with Oregon Department of Transportation, county transportation departments, and other partners to identify and address key areas of wildlife mortality on highways and consider animal movements when planning new roads.**

Wildlife cannot avoid roads, railroads and other linear obstructions. The result is sometimes injury or death for wildlife. In the case of vehicle accidents, people are at risk as well.

Ideally, wildlife movement should be considered during the planning phase of new roads to avoid known migratory routes and to design wildlife passage into the project.

Existing roads affect wildlife. Some established migratory routes that intersect roads can be identified by local or state road crews who repeatedly remove carcasses at these spots. In these cases, bridge replacement and routine highway maintenance provide opportunities to address areas where highway mortality is high. For smaller wildlife species, a culvert under the road may help small mammals, reptiles and amphibians cross safely. Install warning signs for drivers about wildlife crossings. Funnel larger species to larger culverts or underpasses. Additional studies may be needed to advance understanding of wildlife-transportation corridor conflicts, as well as design approaches, so that preventative, cost-effective solutions can be incorporated into project designs.

The Oregon Department of Transportation (ODOT) is exploring ways to reduce wildlife-vehicle collisions on state highways. The department is collaborating with Oregon Department of Fish and Wildlife to develop passage designs that are economical as well as practical for wildlife. Also, Metro has worked with road departments in its three-county area to develop a manual for dealing with wildlife crossings on roadways. The Port of Portland designed and installed culverts for turtles to cross beneath a busy transportation corridor.

■ **Action 4.6. Identify, maintain and restore important stopover sites for migratory birds.**

The use of stopover sites is often for brief periods in the year, but these are just as essential to wildlife as longer-term homes.

Wildlife crossing long distances during migration expend a great deal of energy each day. These animals must stop to rest and feed one or more times each day and at night in order to refuel for the journey. Many sites, such as wetlands and mudflats, are in lowland areas which are important areas for development. Some areas, such as agricultural fields, can be important for migrating birds, especially shorebirds.

Use existing information on the location and value of known sites when planning for new development. Audubon's Important Bird Area program incorporates key stopover sites. Work with partners to evaluate other potential stopover sites. Maintain and restore priority sites. In particular, look for ways to avoid or minimize impacts or alterations to the sites. If impacts are unavoidable, mitigate for any impacts by providing alternative sites nearby. Also minimize disturbance during critical periods. Look for opportunities to work with landowners to provide and enhance bird habitat.

ISSUE 5: Water Quality and Quantity

The droughts of the early 21st Century have heightened awareness of the issues related to water quality and quantity. Ensuring high quality water supplies is a top environmental challenge for the next century throughout the western United States. Water quantity and quality are inseparable issues. Adequate streamflows and natural hydrology help maintain high water quality in Oregon's rivers and streams. Limited water supply compounds temperature and nutrient problems. Water quality and quantity issues are linked to changes in land uses, increasing intensities of land management, growing demand for water, and uncertainty about the role global warming will play in long-term supply.

In the Pacific Northwest, watershed health also is directly related to healthy populations of migratory salmon. Many measures of ecosystem performance, water quality, and watershed health have been linked to salmonid populations.

Overall Goal: Maintain and restore water quality and quantity to support fish and wildlife and habitats in balance with economic and social needs of local communities.

Water quality

Water quality is degraded by many factors, including increased temperature, dissolved oxygen, turbidity (fine suspended sediments), and both point and nonpoint source pollution, including toxic contaminants, bacteria, and nutrients.

A major tool in identifying and prioritizing water quality problems in Oregon is the 303(d) list, required under the federal Clean Water Act. This is a list of water bodies and stream reaches that do not meet water quality standards, and is updated at least every two years. In the Conservation Strategy, the 303(d) list is used in development of Conservation Opportunity Areas to prioritize site selection and to help guide conservation actions.

The Oregon Water Quality Index is a method for quantifying water quality throughout the state, considering dissolved oxygen, biological oxygen demand, pH, ammonia and nitrate nitrogen, phosphorous, total solids, and fecal coliform levels. The index is particularly useful as a comparative tool for various regions or reaches. Like most water quality indices and criteria, this index was developed using criteria for human health. Therefore, more information may be required to assess ecological health of aquatic ecosystems and the potential impacts of degraded water quality on fish and wildlife. Moreover, there is a need for further structural and functional criteria to assess the overall success of aquatic restoration projects.

Oregon's existing framework for water quality

- *Oregon Department of Agriculture Water Quality Plans and Rules* - The Oregon Department of Agriculture, working with local stakeholders, recently completed basin-specific agricultural water quality plans and rules (Senate Bill 1010 plans and rules) for the entire state. The plans include goals, objectives, and recommended management practices for agricultural landowners to improve water quality. The rules require certain conditions to be met on all agricultural lands. Basin-specific plans and rules provide for tailoring to local conditions and needs. All plans will be reviewed and updated biennially with input from local stakeholders. Plans and rules address effects of agricultural lands on water quality, including erosion and sediment delivery, animal waste management, nutrient management, irrigation water management, and riparian area management. Plans and rules focus on outcomes and results, allowing landowners to choose the best practices for their operation to comply with the rules. Although compliance with the rules is required, the focus is on voluntary solutions rather than enforcement. To meet the goals of the plans, landowners typically work with local Soil and Water Conservation Districts, the Natural Resources Conservation Service and Farm Service Agency, and Oregon Department of Agriculture to implement a variety of conservation practices.
- *Water Quality programs with Oregon Department of Environmental Quality* - Oregon Department of Environmental Quality

2002 Oregon 303(d) Listed Streams**Legend**

— 303(d) limited streams

--- Basin

Ecoregion

■ Basin & Range

■ Blue Mountains

■ Coast Range

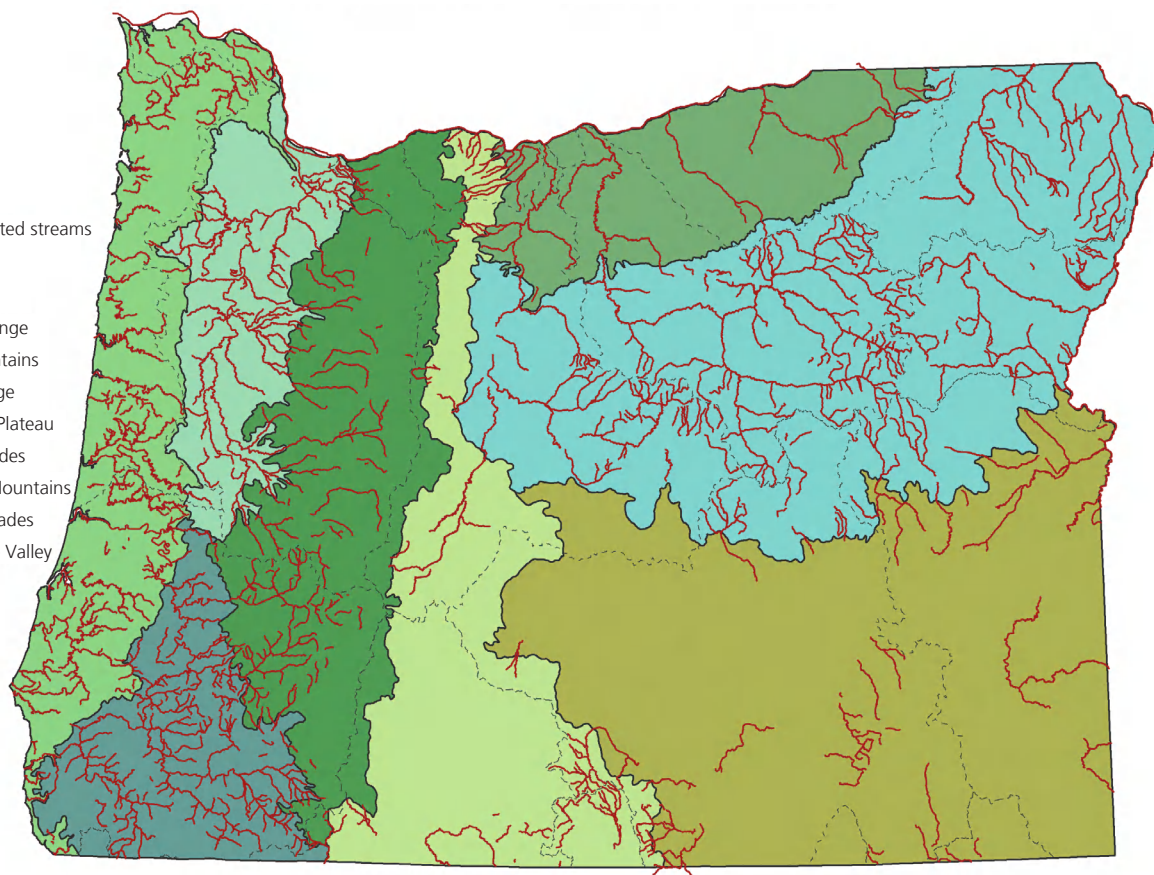
■ Columbia Plateau

■ East Cascades

■ Klamath Mountains

■ West Cascades

■ Willamette Valley



Data Source: Oregon Department of Environmental Quality

is responsible for protecting the state's surface waters and groundwater to keep these waters safe for a wide range of uses, such as drinking water, recreation, fish habitat, aquatic life, and irrigation. For example, the Department of Environmental Quality develops water quality standards; monitors water quality; regulates sewage, industrial discharge, and injection systems; inspects septic systems; works with public drinking water systems; and works to control nonpoint source pollution.

The DEQ uses standards called Total Maximum Daily Loads (TMDL) as a primary approach to identifying and addressing water quality issues. A TMDL is a pollution analysis to see how much a pollutant must be reduced to meet required Water Quality Criteria. TMDLs are basin-specific and address types of pollutant sources; load allocations (portions of loading capacity to be allocated to existing nonpoint sources or background sources); seasonal variation and reserve capacity of the system. Because they are basin-specific, TMDLs consider individual basin hydrography, climate, streamflow, dam and reservoir operations, land use and ownership, and local fish and wildlife.

Several TMDLs have been completed for Oregon, with the goal of having TMDLs completed for all basins by 2010. Successful implementation of the TMDL is defined as compliance with the implementation plan, Senate Bill 1010 plan, Forest Practices Act rules, or federal Water Quality Restoration Plans. Developing methods for effectiveness monitoring of TMDLs is ongoing.

- *Water Quality programs with Oregon Department of Forestry* - Oregon Department of Forestry manages state-owned forestlands in Oregon and administers the Forest Practices Act on all private, state, and local government forestlands outside of urban growth boundaries to ensure that water quality is maintained during and after commercial forest operations. The 2000 State of the Environment Report stated that instances of good or excellent water quality occur most often in the forested uplands of Oregon.

Additional information relating to these programs can be found in Appendix III.

GOAL AND ACTIONS

Goal: Maintain or restore water quality in surface and ground-water to support a healthy ecosystem, support aquatic life and provide fish and wildlife habitat

Actions:

■ **Action 5.1. Reduce runoff from impervious surfaces.**

In urban areas, runoff from paved areas reduces water quality and can release contaminants into the water.

Increase cooperation between governments, watershed councils and businesses to reduce impervious surfaces and run-off to storm sewers in urban areas. Promote and permit “green infrastructure,” that reduces run-off such as disconnecting downspouts, installing green (“living”) roofs, and using permeable paving materials. Manage stormwater to minimize transfer of contaminants to streams. Restore riparian vegetation buffer strips and use native landscaping and bioswales to filter runoff. Continue ongoing water quality assessments and restoration programs (e.g., City of Portland program to filter runoff via fallen leaves).

■ **Action 5.2. Restore wetlands and riparian areas to increase filtration of sediments and contaminants.**

Wetlands often have low or no water flow, which allows sediments to fall out of the water column. Native wetland vegetation such as cattails, rushes and sedges can concentrate certain contaminants in their leaves and roots, thereby removing contaminants from the water. Native riparian vegetation filters sediment before it reaches streams. Riparian vegetation also provides the thermal conditions that are favorable to fish and other aquatic species. Restoring wetlands and riparian areas allows these natural processes to occur.

■ **Action 5.3. Implement water quality improvement projects and management frameworks.**

Minimize run-off of sediment from logging, agriculture, roads, urban and rural construction, and other activities that disturb soil. Some strategies are terracing fields, filtering run-off before it enters aquatic systems, installing sediment control basins to reduce erosion and practicing conservation tillage. When constructing new roads, consider sediment catchment and removal in road design. Use tax credits, pollution credits and other tools

to reduce the amount of contaminants entering waterways.

In urban areas, continue educational efforts in urban areas such as “Dump no waste, drains to stream” postings at sewer drains.

Continue implementing Oregon Department of Environmental Quality Total Maximum Daily Load planning and Oregon Department of Agriculture Water Quality Management planning, which address water quality holistically throughout watersheds, including nonpoint sources of contaminants.

■ **Action 5.4. Monitor structural, compositional, and functional parameters of aquatic habitats for changes in water quality.**

National and regional programs use water quantity and quality indicators to assess ecological function (i.e., Heinz Center; Oregon Progress Board; National Research Council). Several indicators of water quality have been well developed and characterized. Use of indicators provides for characterizing status, detecting change, and diagnosing the causes of change. Examples of biological indicators include: benthic community indices (for example, Index of Biotic Integrity); species richness, number of native taxa, relative abundance of sensitive taxa, biomass, productivity; salmonid population (structure, abundance, productivity, diversity); and species interactions (predation, competition, invasive). Examples of physiochemical indicators include water clarity, pH, wetland area, temperature, dissolved oxygen, nutrient levels, chlorophyll A, Total Suspended Solids, or the presence of specific toxic contaminants. Indices can be linked to specific stressors using a weight of evidence approach that combines existing data, literature, and scientific judgment to make predictions about ecological characteristics.

■ **Action 5.5. Maintain and restore native vegetation throughout watersheds, including upland areas, riparian corridors and floodplains.**

In addition to restoring riparian and wetland habitats, restoring vegetation throughout the watershed contributes to water quality by maintaining water infiltration and flow, holding soil, and preventing contaminants from entering aquatic systems.

Water quantity

In some areas of the state, particularly in the summer, water is entirely allocated to out-of-stream uses that reduce the ability of watersheds to provide quality habitat. Diversions are made for agriculture, municipal,

industrial, domestic, and power generation uses. Other physical alterations to water quantity and flow include barriers, wetland drainage, or channelization. Timing of diversions and external factors influence disturbance regimes, sediment transport, and groundwater storage. For example, the timing of water release at dams can have critical implications for water temperature, which can have differential impacts on the timing of salmonid migration. Global processes, including climate change, influence temperature and precipitation patterns, and can potentially affect stream runoff and water supplies.

In Oregon, the Water Resources Department is the state agency with the greatest responsibility for holding instream rights in trust to support the public interest, including uses for recreation, pollution control, navigation, and fish and wildlife habitat (Instream Water Rights Act of 1987). To protect fish populations, Oregon Department of Fish and Wildlife applies for instream flows based on estimated monthly requirements to sustain healthy fish populations. Additionally, Oregon Department of Fish and Wildlife biologists provide advisory comments regarding water right applications' impacts on fish and habitat.

GOAL AND ACTIONS

Goal: Maintain or restore sufficient stream flows to support aquatic species and Strategy Habitats.

Actions:

- **Action 5.6. Work with Oregon Water Resources Department and the Oregon Department of Environmental Quality to develop tools to maintain in-stream flow (e.g., water markets and water banks).**

Economic and environmental assessments into the possibility of including in-stream flow water markets are ongoing. A pilot investigation has been conducted in the Deschutes region. The Northwest Power and Conservation Council is considering results of these assessments, along with subbasin planning, in investigating the feasibility of such markets.

- **Action 5.7. Seek opportunities to restore aquifer recharge and maintain groundwater.**

Groundwater levels are declining in many areas. Seek opportunities to restore aquifer recharge to restore and maintain groundwater. For example, restore floodplain function and restore wetlands to allow for greater water infiltration. Continue implementation of Oregon's groundwater quality protection act, implemented by Oregon Department of Environmental Quality.

- **Action 5.8. Use established indicators to monitor watershed function and determine thresholds for action.**

Water quantity and availability need to be monitored, and watershed function and processes need to be better understood to guide restoration.

Use the existing indicators for watershed health, which have been extensively studied and linked to ecological function. These indicators include: altered hydrology (hydrography); floodplain presence and connectivity; groundwater availability; riparian condition (width, composition and fragmentation); stream connectivity; channel condition and habitat structure (habitat types, bank erosion, channel substrate, off channel habitat, large wood). Integrated hydrologic and water quality models simulate flow and other important characteristics. Habitat equivalency analysis and net environmental benefit analysis models use habitat characteristics to predict ecological changes that might result from proposed hydrological alterations. Continued use of these indicators, when combined with actions to address problems with watershed function, will help ensure that watersheds provide essential ecological services to humans, fish and wildlife. Continue to develop methods of determine if sufficient water exists to maintain ecological function and when conservation actions may be needed.

- **Action 5.9. Work with Water Resources Department and other partners to establish priorities and implement projects to restore stream flow.**

The Oregon Department of Fish and Wildlife and Water Resources Department have developed stream flow restoration priority maps showing flow restoration needs and priorities. The maps display each river basin, with rankings for stream flow restoration need, feasibility for stream flow restoration, and priorities for restoration. Additional information, including a summary of the prioritization process and the criteria used to establish the priorities is located at <http://rainbow.dfw.state.or.us/nrimpl/information/streamflowmaps.htm>.

Use these priorities to implement projects that restore stream flows. Collaborate with ongoing water quantity efforts taking place under the Oregon Plan (Oregon Watershed Enhancement Board). Use voluntary conservation tools such as the Conserved Water Program, and purchase and lease of in-stream water rights to restore stream flows.

ISSUE 6: Institutional Barriers to Voluntary Conservation

Across Oregon, landowners are already voluntarily doing work to benefit fish and wildlife, whether by replacing culverts, restoring streamside vegetation, placing large wood in streams, restoring wetlands, or excluding cattle from highly sensitive areas. Evident through participation in Watershed Councils and a history of on-the-ground projects, Oregon's landowners take pride in their land management.

However, in some cases, institutional barriers prevent landowners from completing projects that will benefit fish and wildlife. These barriers include the difficulty of obtaining multiple permits, cumbersome requirements for financial assistance, and rules originally passed for one purpose that block another one. Long-term voluntary participation by Oregonians in conservation can be increased if Oregon can build on successful landowner-assistance programs to address institutional barriers and create a voluntary conservation system that is streamlined, user-friendly, flexible and collaborative.

This section briefly summarizes some key actions to address institutional barriers. These actions and other opportunities are discussed more fully in the Voluntary Conservation Tools section starting on page 70.

GOAL AND ACTIONS

Goal: Share information, streamline processes, and seek creative programs that support voluntary conservation actions.

Actions:

- **Action 6.1. Streamline permitting processes for habitat restoration projects and application processes for financial incentive programs. And,**
- **Action 6.2. Resolve conflicting regulations that hinder conservation and restoration of Strategy Habitats.**

Permitting processes can be complex and time consuming for landowners and managers. Similarly, conflicting regulations create confusion and uncertainty that hinders conservation and restoration of Strategy Habitats.

Providing technical assistance to landowners is a short-term solution. For example, personnel from agencies or other groups sometimes complete the permit applications on behalf of landowners. Also, educational materials produced by the Oregon Watershed Enhancement Board help explain the various permits needed for projects in aquatic and riparian habitats.

However, in the long-term, incentive program providers and regulatory agencies should look for opportunities to streamline the permitting process and address conflicting regulations.

Some local governments, such as the City of Portland, have been working with state and federal natural resource agencies to streamline regulatory processes. The Governor's Regulatory Streamlining Initiative can serve as a means for addressing some of these issues.

One example of a current streamlining effort is current work by the Water-Related Permit Process Improvement Team (WRPPIT). The goal of this process is to develop a user-friendly coordinated process for project applicants to obtain permits for all water-related permitting activities conducted by state agencies. As a first step, an inter-agency permitting pamphlet is being created to inform people about the various permitting requirements of the state agencies. Future efforts will include clustered external stakeholder meetings to determine concerns and interagency training sessions.

Another example of regulatory streamlining is to take programmatic approaches to federal consultation requirements. In 2004, the Natural Resources Conservation Service in Oregon, along with three soil and water conservation districts, developed a Biological Opinion with National Marine Fisheries Service to protect 12 species of federally listed salmonids. The biological opinion covers dry cropland, range, and pastureland in Gilliam, Sherman, and Wasco Counties for landowners who develop and implement a conservation plan for resource sustainability. The biological opinion concludes that these activities are not likely to adversely impact the listed species or their habitats. The opinion meets the requirement for consultation between federal agencies under the Endangered Species Act, streamlining the regulatory process for landowners.

- **Action 6.3. Improve coordination and delivery of incentives programs to more effectively serve landowners and more strategically address needs of Strategy Species and Habitats.**

There are dozens of assistance and grant programs available to landowners and organizations. However, there also are dozens of different program applications and requirements that can limit the synergy and participation in these conservation opportunities. People face a daunting challenge in order to complete

the paperwork. For complex projects involving multiple partners and funding sources, it can be difficult to receive approval from several agencies or foundations, each of which may have different goals, criteria, and standards for monitoring, completion or success. Opportunities to make incentive programs more coordinated and “user-friendly” include developing common applications and requirements across similar programs, increasing technical assistance, increasing program flexibility where feasible, and involving landowners in program design.

■ **Action 6.4. Improve data management, coordination and sharing between various conservation partners to support voluntary conservation.**

Effective restoration requires collecting, analyzing, and sharing data in order to adapt activities to changing conditions or to better meet goals. Currently, a variety of entities collect data using different protocols and there is a need for greater coordination to improve adaptive management throughout the state. Additionally, agencies need to partner to make most efficient use of limited resources and to reach shared goals. Strengthening data management and sharing is a key recommendation in the Monitoring chapter (see page 102).

Some approaches include identifying critical data collection activities and associated data management efforts; establishing a consistent data management system; adopting and using

standard protocols for database design data collection and metadata development; and developing web portals for information sharing.

■ **Action 6.5. Expand technical assistance and delivery of services to landowners through outreach and stakeholder involvement.**

There are many forms of technical assistance that can benefit landowners. Landowners often want help in designing projects, applying for funds, obtaining permits, and conducting on-the-ground work. There often is not enough technical assistance to fulfill existing need, much less to expand it to cover underserved landowners, geographic areas, and habitats. In some incentive programs, technical support is poorly or not funded at all.

Some ways to increase technical assistance to landowners include increasing coordination between incentive program staff, providing training for watershed councils and other groups that work with landowners, developing additional technical outreach materials, providing “one-stop shopping” for technical assistance, conducting outreach to let more landowners know about existing assistance, providing web-based information tools, and developing alternative funding sources and pursuing grants to expand technical assistance.



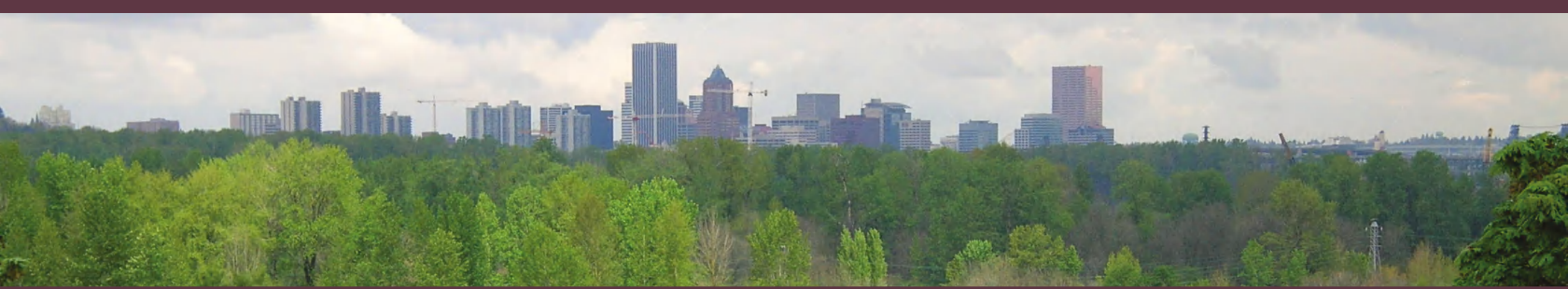


Photo © Mark Wilson, Portland Parks and Recreation

A Place for People and Wildlife: Conservation in Urban Areas

Across the United States, about 80 percent of people live in cities. If all of Oregon's urban areas were placed together, they would cover approximately 6 percent of the state's land area. In 2000, 73.1 percent of Oregon's population lived in metropolitan areas, according to the U.S. Census Bureau. Portland is the largest urban center in the state, and has been recognized as a national model for urban natural resource planning. Many towns and cities across the state are expanding to respond to the needs of a growing population, and rural farms and forests have been converted to urban and industrial uses. These trends are expected to continue, presenting both challenges and opportunities in natural resource management.

Urban areas are characterized by the prevalence of built structures and impervious surfaces, which alter surfaces and water flow, degrade water quality, reduce vegetation cover and diversity, and cause habitat loss, fragmentation and degradation. Urban areas are also centers of human activities that can displace sensitive fish and wildlife; introduce and spread invasive species; generate pollutants, noise, heat and artificial lighting that can disturb wildlife; and pose hazards to wildlife from people, roads, pets, buildings and other factors.

Conversely, urbanizing areas can be designed to contribute to conservation goals by setting aside ecologically important natural areas inside of urban growth boundaries, and containing and directing growth in ways that protect habitat in more rural areas. In addition, because the majority of the population lives in cities, urban areas provide tremendous opportunities for reaching and engaging the public in wildlife conservation efforts both within and beyond their local communities.

Conservation Overview

Rivers and waterways tend to attract human settlements. They also are hot spots for fish and wildlife species diversity. This provides both a challenge – to sustain fish and wildlife species and habitats under conditions of increasing development – and an opportunity – to create cities where people can benefit from and enjoy nature. While urbanized lands

already have impacted today's conservation opportunities, and future urbanization likely will present further challenges, some of Oregon's urban areas have made impressive efforts to contribute toward fish and wildlife conservation. For example, significant habitats have been set aside through parks and greenspaces in the Portland Metro region, Eugene metropolitan area, and elsewhere.

A full array of Oregon's valuable aquatic and terrestrial habitats are found in urban areas, including oak woodlands and savannas, native grasslands and sagebrush, bottomland hardwood forests, coniferous forests, and other important habitats. Urban streams and riparian areas support salmon and trout, as well as other native fish, and a host of amphibians, reptiles, mammals, birds and invertebrates. Protecting and restoring these important habitats and species will not only help to conserve Oregon's natural heritage, but will also provide valued ecosystem services for the public. For example, riparian areas are critical for protecting water quality and reducing flood hazards, while also providing complex and highly productive in- and near-stream habitat for fish and wildlife.

Human-created habitats can also be significant contribution to wildlife habitat in urban areas. For example, native plant gardens and native landscaping, backyard ponds, and bat and bird roost and nest sites on buildings, bridges, and utility poles can provide places for some wildlife species to feed and rest. ODFW's *Naturescaping* book has information on providing habitat in urban areas. Creating backyard habitats and building habitat features into existing structures are excellent approaches for supplementing natural habitats in urbanized areas. In addition, setting aside functional habitats and enabling the use of that habitat by incorporating design features such as wildlife corridors and safe road crossings, can help to accommodate the needs of fish and wildlife within the built environment.

While scientific guidance is available for incorporating conservation into urban land use planning, much is still unknown. Fortunately, the study

of “urban ecology” is rapidly advancing and receiving recognition, both by urban planners and by traditional ecologists. For example, in 1997, the U.S. National Science Foundation added Baltimore and Phoenix to its list of sites for studying ecosystems over time, called the “Long Term Ecological Research Network.” Ecological research has been primar-



Bald eagles: Greenspaces set aside in urban areas have been important components of bald eagle recovery, as the eagles have recolonized some of their historical habitats. This example shows that urban areas can play a role in supporting fish and wildlife populations.

ily focused on “pristine” ecosystems and rural areas, but biologists, planners, and policy makers recognize the need to understand the ecological issues related to urbanization. Now, there are several university-based institutes for urban ecology, city-based nature organizations, and urban-focused projects and programs currently being implemented by the National Park Service, U.S. Forest Service, and U.S. Geological Survey. Many of

these organizations and programs focus on both conserving urban fish and wildlife and restoring urban ecosystems.

Urban Conservation Issues and Approaches

Issue: Limited natural areas. Buildings and paved surfaces fragment and reduce the extent of wildlife habitats in urban areas. Open space is often limited and isolated, and many areas that are de-

veloped do not retain enough native vegetation and other natural features to provide wildlife with adequate food, water, cover and mobility.

Approach: Plan growth and development that incorporates the protection of large, functional and connected habitats as “green infrastructure”, providing interconnected networks of protected natural areas designed to support native species, maintain natural ecological processes, sustain air and water resources, and contribute to the health and quality of life. Encourage “Naturescaping.” When planning redevelopment projects, look for opportunities to restore habitats, increase connectivity and improve floodplain function.

Park and greenspace programs provide excellent opportunities for building fish and wildlife habitat into urban areas, while contributing to people’s recreational opportunities and quality of life. For example, The Metropolitan Greenspaces Master Plan, adopted by the Metro Council in 1992, describes a vision for a regional system of parks, natural areas, greenways and trails for fish, wildlife and people. The plan identifies 57 urban natural areas and 34 trail and greenway corridors that define green infrastructure for the Portland metropolitan region. The plan is being implemented by local park providers, schools, businesses and citizen groups through a combination of open space acquisition, land-use standards, incentives and stewardship. Eugene and other cities are also incorporating greenspaces into their park programs.

Issue: Need to integrate social and ecological concerns: There is a tremendous need to study and address the social (e.g., environ-

Salmon Conservation in Urban Areas

Oregon’s Independent Multidisciplinary Science Team, the statewide team of scientists charged with infusing sound science into the application of the Oregon Plan, is working on a project focused on land use in urban and rural residential areas. The project recognizes that native salmon rely on some urban streams and rivers for spawning, rearing



and traveling. The project will determine how urban areas and their management can contribute to healthy salmon and watersheds, and

recognizes the emerging field of urban ecology. The project will result in a technical report and specific recommendations to state agencies involved in salmonid recovery and land management.

mental education and stewardship, environmental economics, etc.) and ecological aspects of conservation in and around urbanizing areas. There are few studies designed to understand urban ecology and social systems and how they can contribute to fish and wildlife conservation.

Approach: Increased recognition of the significance of the fields of urban ecology and environmental social sciences will attract research and monitoring attention to studying these issues in and around urban systems. Build partnerships between researchers and data users, and seek resources for research that will increase understanding of how urban systems can be designed to help sustain fish and wildlife populations with a high level of public support and involvement. As the fields of urban ecology and environmental social sciences become more established, more sources of funding can be identified. Applying this information to open space acquisitions, habitat restoration, regional and local land use planning, environmental education, public outreach and other aspects of conservation is critical for building effective conservation strategies and public support now and into the future.

Issue: Education and outreach: Urban areas are where most people live, presenting an unparalleled opportunity to reach, serve and support a large segment of Oregon's population. Education has tremendous value as a means of informing landowners, voters, visitors, politicians and other decision-makers and stakeholders about ways they can contribute toward fish and wildlife conservation.

Approach: Direct resources at populated areas to educate Oregonians about Oregon's natural heritage, show people real-world examples

of important habitats and projects, and build an appreciation that will lead to citizen actions and support for conservation. Stewardship, involvement in restoration projects, and opportunities to view fish and wildlife and experience nature can have high value when experienced as part of peoples' daily lives. Additionally, protecting nature in cities provides opportunities for education and outreach close to home that may not otherwise be available to the general public. (For more information the Conservation Strategy's priorities for outreach and education, see pages 90 to 93).

Issue: Paved surfaces alter hydrology and prevent filtering of pollutants. In cities, large expanses of landscape are covered by paved impervious surfaces, creating challenges for managing stormwater runoff in ways that protect watershed and stream health. Resulting hydrological alterations can have significant impacts on the surrounding landscapes. Development also tends to encroach into riparian areas and floodplains that are known to provide critical functions for maintaining healthy streams and key fish and wildlife habitats.

Approach: Seek ways to incorporate ecological considerations into development activities. Work with partners (U.S. Environmental Protection Agency; Oregon Department of Environmental Quality; Watershed Management Institute; others) to further understand and learn about effects of urbanization on watersheds, to test management actions, and to consider and use new information as it becomes available. To minimize pollution and the adverse affects of altered hydrology, promote programs designed to manage stormwater so it closely mimics natural flow patterns, cleanse

Willamette River Renaissance

"Renaissance" means "renew," and a true renaissance is underway along the Willamette River in Oregon. The River Renaissance program is working to connect Oregonians to the river, a vital driving force in local economies and visions and the key interface between fish, wildlife and people. In Portland, the program is well underway, working to expand parks and natural areas along the river while reconnecting with Oregon's history and heritage. The vision is of a vibrant waterfront providing cultural events and housing while supporting the regional economy and sustainable business practices. River Renaissance views the Portland Harbor Superfund listing, and Portland Harbor project, as an

opportunity to identify and work with industrial district partners, and to identify new partners in enhancing the harbor. Private property owners, schools and other community groups are all encouraged to participate in various programs. River Renaissance provides vital connection and coordination among many ongoing activities related to the Willamette and its watersheds, with a focus on those in the Portland area. The goals of River Renaissance may have broad appeal to other Willamette corridor cities including Salem, Corvallis and Eugene as many Oregonians increasingly recognize both the value of their local waterfront and the value of healthy watersheds, and work to connect the two.

runoff before it is released to natural water bodies and discourage dumping into storm drains.

Issue: Stakeholder involvement: There is enormous potential to reach many new stakeholders in urban areas from the private sector (for example, landowners, businesses and the industrial community) that have not yet become involved in fish and wildlife conservation efforts.

Approach: Encourage stakeholder involvement and concern for conservation issues by recognizing the positive contributions that individuals, businesses and industry have made locally, by informing them of conservation opportunities, and by involving them at the table in decision-making. Directly engage them in projects and in developing conservation approaches. Retain focus on local issues to keep people engaged, but link to larger landscapes when there is interest and opportunity. Work with business councils on conservation and fish and wildlife issues.

Issue: Multiple jurisdictions: Fish and wildlife conservation issues cross land ownerships and jurisdictional boundaries (cities, counties, agencies), presenting challenges to conservation because landowners, government entities, and local and regional groups do not always coordinate to address issues that may be ecologically connected, but politically or programmatically separate.

Approach: Recognizing the uniqueness of each local community and the needs of various landowners, seek methods to achieve cooperation and coordination. Promote the exchange of information and provide guidance to landowners and local communities that can be used in their efforts to protect and restore habitat, set aside green infrastructure systems and plan urban growth strategies that can help sustain fish and wildlife populations and ecological function across the landscape. Create cost-share funding opportunities for conservation planning and project implementation.

Issue: Need for innovative restoration techniques: The types of on-the-ground projects needed to improve habitat in urban areas

Some Priority Actions, Resources, and Ongoing Efforts in Oregon's Urban Areas

Action	Habitat	Source document
Retain large connected areas with natural habitats	All	City of Portland Framework for Integrated Management of Watershed Health 2004; Portland Parks and Recreation Department; Lane Council of Governments Rivers to Ridges Vision 2003
Protect off-channel, shallow water and in-stream habitat while providing recreation opportunities	Waterfront and large rivers	City of Portland Framework for Integrated Management of Watershed Health 2004; Lane Council of Governments Rivers to Ridges Vision 2003
Integrate fish and wildlife habitat conservation into other related natural resource protection efforts including planning, regulations, acquisitions, on-the-ground actions and monitoring (for example, water quality programs, open space acquisitions)	All	City of Portland Framework for Integrated Management of Watershed Health 2004; Portland Parks and Recreation Department; City of Portland Bureau of Environmental Services and Clean Water Services Watershed Management Plans; Lane Council of Governments Rivers to Ridges Vision 2003
Control invasive species and minimize the introduction of invasive species. Use native species for landscaping and restoration.	All	City of Portland Framework for Integrated management of watershed health 2004
Incorporate habitat features and functions into the built environment (wildlife road crossings; rooftop gardens and nests; artificial habitat structures)	Developed	City of Portland Framework for Integrated Management of Watershed Health 2004
Consider a range of program options and tradeoffs for habitat and urban development, incorporating economic, social, environmental and energy criteria [tools can include restoration, acquisition, grants, education/information, property tax reduction programs, technical assistance, volunteer programs, and recognition programs].	Upland and aquatic	Portland Metro (Title 3; Nature in Neighborhoods; other programs); Lane Council of Governments Rivers to Ridges Vision 2003
Monitor change in urban ecosystems using broad-scale indicators in urban settings	All	Portland Metro; Urban Ecosystem Research Consortium
Integrate information about habitats and species from state and federal natural resource agencies and conservation groups into local and regional planning efforts.	All habitat types	Multiple local, state and federal agencies, universities and non-profit organizations

include, but often go beyond, the traditional suite of restoration practices that are most commonly supported by existing funding sources.

Approach: Support habitat improvement projects geared toward the needs, opportunities and high level of public interest in carrying out environmentally beneficial projects in urban areas. Provide technical and financial support for projects such as managing stormwater to more closely mimic natural hydrology, landscaping with native plants, restoring historically important habitats when sites are redeveloped, environmental education and outreach, and other conservation actions. These activities can provide significant opportunities for habitat protection and improvement, and are important for engaging and serving the public.

Issue: People-wildlife conflicts: Wildlife species that do adapt to living in a human-dominated environment frequently can become a nuisance due to noise, defecation and other messes, property damage, or unwanted encounters with domestic pets. These

conflicts can result in unnecessary wildlife deaths and lower public support for wildlife conservation.

Approach: Support and expand existing programs to provide information on preventing and resolving conflicts with wildlife. In particular, provide proactive, seasonally appropriate advice. Because human-wildlife conflict issues often are biologically and socially complex, create multi-stakeholder/interagency tasks force to address major issues.



Wild in the City – Lessons from Chicago Wilderness

In 1996, a coalition of diverse organizations launched Chicago Wilderness to restore, protect, and manage the thriving mosaic of natural areas embedded in the nation's third largest metropolitan area. Over 170 private and public organizations now belong to the coalition, pooling their resources and expertise. The consortium's mission is to restore the region's natural communities to long-term viability, enrich local residents' quality of life, and contribute to the preservation of global biodiversity. The consortium created a Biodiversity Recovery Plan to help guide its work toward these goals. The plan is intended to complement the other planning and guides the consortium's work on projects in the areas of science, land management, sustainability, education and communication.

In addition to being a model for collaborative conservation, the Chicago Wilderness Coalition also demonstrates tremendous business involvement in the major regional habitat effort. Business partners provide habitat or other natural functions on their property, give in-kind contributions to local agencies or organizations, support fundraising efforts, and provide volunteer employees. In addition, a core group of businesses has founded the Chicago Wilderness Corporate Council. By joining the Corporate Council and paying the annual corporate

membership fee (\$2,500 to \$10,000), local businesses are making a significant commitment to improving the local environment.

In Portland and Eugene, Oregonians are exploring ways to emulate the Chicago Wilderness' success. In 2004, representatives from Chicago Wilderness shared their experiences with people working on conservation issues in both the Portland-Vancouver and Eugene-Springfield metropolitan areas. The gatherings brought community members together to reflect on the local conservation history, celebrate successes, and ponder future directions. In Eugene-Springfield, a fledgling Emerald Biodiversity Council is being developed around the conceptual goals of promoting education about, and stewardship of, the southern Willamette Valley's rich natural heritage; promoting information sharing; fostering collaboration and networking on projects; and providing expertise and technical guidance.

For more information see:

- Chicago Wilderness
www.chicagowilderness.org/coalition/ccouncil
- Emerald Biodiversity Council
<http://camasnet.org/ebc>



Photo © Bruce Campbell

How to Get the Job Done: Voluntary Conservation Tools

As a non-regulatory, voluntary approach to conservation, the Conservation Strategy relies on effectively using a wide variety of incentives, assistance and other tools that can help landowners and land managers provide fish and wildlife habitat on their land. Private landowners play a significant role in conserving habitats and species. Forty-six percent of Oregon land is privately owned. Some habitats occur primarily on private property; most fish and wildlife species use habitats on private land and some species are dependent on habitats found only on private land.

Publicly owned lands play an equally important role in species and habitat conservation in Oregon. Many public lands could provide greater conservation benefits through restoration efforts or changes in management activities. Coordination of land uses and management activities on adjacent lands is important for both private and public landowners because species and habitats, as well as problems like severe wildfire and disease, occur across landscapes. Voluntary Conservation Tools can link efforts on public lands with stewardship on private lands to meet Conservation Strategy goals for habitat conservation.

Voluntary Conservation Tools need to account for differences in landowners' goals and motivations, as well as property characteristics. For many landowners, financial and practical assistance are strong incentives to take conservation action. Others may only want some technical advice.

In the long-term, using voluntary conservation tools to implement this Conservation Strategy's goals may require new approaches or new funding sources. New approaches could involve adapting, combining, streamline or otherwise improving existing federal, state, and local programs, when compatible with program intent and guiding legislation. New funding could come from engaging new constituents, such as business leaders, or tapping new or underutilized funding programs. This chapter summarizes the types of voluntary tools available, describes

how existing programs might be adapted to better meet conservation goals, and presents some new opportunities.

Types of Voluntary Conservation Tools

In each state, dozens of voluntary programs contribute to habitat conservation. Some programs are administered by the state, while others are federally funded or offered by private organizations. Several tools are available only on private land: income and property tax benefits, acquisition of land as fee title or conservation easement, and market-based approaches. Some apply to both private and public land: regulatory assurances, regulatory and administrative streamlining, direct funding (cost-sharing or grants), land exchanges, technical assistance, information and training, and landowner recognition. Most of these efforts involve cooperative partnerships between public agencies, private landowners or landowner groups, conservation groups, watershed councils and land trusts.

Voluntary programs for habitat conservation generally fall into one or more of the categories described below. Landowner interests, priorities, and qualifications; habitat quality and quantity; species presence; and long-term costs and benefits all influence their program selection. Landowners may also weigh choices that include changing land uses (growing habitat instead of crops) or transferring ownership from private to public.

Certification Programs. More and more consumers are interested in conservation-friendly products and services. Certification programs set management standards for sustainable ecological, social, and economic practices in agriculture or forestry. They provide independent review and validation that these standards are being met. These market-based programs encourage landowners to use sustainable practices and benefit landowners by providing access to new markets. Certification programs serve as vehicles for niche-marketing, linking conservation-minded producers with consum-

ers who value their products. Agricultural certification programs include Oregon Tilth Certified Organic (for producers, processors, handlers, or restaurants), Salmon-Safe, Food Alliance Certification, and Oregon Country Beef. Vineyard certification programs include VINES (Viticultural Indicators for Environmental Sustainability) and LIVE (Low Input Viticulture Enology). Forest certification programs include the American Tree Farm System, the Sustainable Forestry Initiative, the Forest Stewardship Council, Green Tag, Program for the Endorsement of Forest Certification and other industry standards. Some certification programs are particularly applicable to urban areas, such as Leadership in Energy and Environmental Design (LEED) certification and other “green building” programs, environmentally-friendly golf courses, salmon-safe parks, and even for “wildlife friendly” backyards.

Conservation Banking. A conservation bank is an area of habitat managed and restored for its natural resource values. The resource values gained from a conservation bank are generally sold as “credits” to project proponents who seek mitigation opportunities to compensate for resource impacts elsewhere. Traditionally, banking has been used to mitigate for impacts to wetlands and threatened or endangered species. Conservation banks can be established by local and state agencies or private parties. Conservation banking programs allow people to pool mitigation from multiple projects, which can result in more strategic mitigation. Conservation banks can take advantage of economies of scale and simplify the regulatory compliance process for individual project proponents. They often provide a better alternative to mitigation done for individual project impacts.

Water Rights Acquisition and Leasing. There are many techniques for improving stream flow. In 1987, the Oregon legislature amended the state’s water laws to provide incentives for water rights holders to conserve water resources and to allow for protection of instream water rights by purchasing, leasing, or accepting a donation of existing water rights for conversion to instream rights. The Instream Water Rights Act allows the state to apply for new instream water rights and private parties to create instream rights by purchasing, leasing, or accepting a donation of existing water rights for conversion to instream rights. There are a diversity of options for water rights holders ranging from lease or transfer of their entire right to partial transfers through rotation agreements between diverters, time-limited transfers, split-season instream leasing.

Oregon’s conserved water statute was passed by the Oregon Legislature in 1987. The Conserved Water Program, administered

by the Oregon Water Resources Department, makes it possible for a water user who voluntarily conserves water through improved efficiency to retain 75 percent of the saved water and reallocate it to irrigate additional lands, lease or sell the water, or dedicating the water to instream use.

Several non-profit organizations work with water right holders to enhance instream flows (e.g. Oregon Water Trust, Deschutes River Conservancy, and the Klamath Basin Rangeland Trust). The Oregon Watershed Enhancement Board and Bonneville Power Administration (through National Fish and Wildlife Foundation’s Columbia Basin Water Transactions Program) provide funds to organizations to pay willing irrigators fair market value to acquisition or lease water rights.

Direct Funding Programs. Public agencies and private organizations make direct payments to private landowners or landowner organizations to support actions to conserve and restore fish and wildlife habitat, improve water quality, or improve land management activities. These payments are made as grants, purchased conservation easements or fee ownership in land, cost-share payments, and rental payments. Many programs that provide direct payments for acquisition, restoration, or management require a matching financial or in-kind contribution, usually between 10 percent and 50 percent. Usually federal payments must be matched with non-federal contributions. Some programs further require landowners to enter into a temporary agreement or easement to ensure the public investment in restoration or protection will be maintained.

Information and Training. Some landowners are self-motivated to conserve species and habitats on their property and only need information about what to do and how to do it. Information or training may come from agency staff, Oregon State University Extension Service and other university programs, watershed councils, conservation groups, consultants, and/or other landowners. Demonstration projects are an excellent vehicle for sharing information about habitats, conservation activities, programs that can assist landowners, and personal experiences.

Conservation Easements. A conservation easement is a voluntary, but legally binding agreement that allows a landowner to give up one or more of their rights (for example, rights to subdivide and develop) on a given piece of land while retaining the remainder of the rights (for example, rights to farm). In Oregon, state and federal agencies, metropolitan districts, tribes, and non-profit organizations are qualified to hold easements. Oregon has over 27 million acres of private land, and only a very small fraction of

private land is within a conservation easement. For example, approximately 27,000 acres are held by land trusts; 29,000 acres by Oregon Department of Fish and Wildlife; 48,000 acres by Oregon Watershed Enhancement Board; 50,000 acres by Natural Resource Conservation Service; and 400 acres by U. S. Fish and Wildlife Service. Other easements are owned by non-profit groups such as Ducks Unlimited.

Conservation easements can be designed to accomplish specific objectives, such as to protect habitat for an endangered species; or it can be designed more broadly to protect farmland or open space. Because they are flexible they can also be tailored to the particular piece of property, wishes of the landowners, and goals of the easement holder. In some cases, a conservation easement is purchased, providing income to the landowner. Alternatively, landowners who donate conservation easements may qualify for federal, state, or estate tax benefits. Conservation easements may be particularly appealing to landowners if only a portion of the property is used to meet conservation goals. Typically easements are permanent, ensuring that protection of the land's values remain in place even with a change of ownership.

Land Acquisition, Donations, and Exchanges. Many public agencies (examples: U.S. Forest Service, Oregon Watershed Enhancement Board, or local governments) and private (example: land trust or watershed councils) conservation organizations acquire land from willing sellers. Land acquisitions can be made at fair market value or donated. A number of funding programs provide grants for land acquisitions (e.g., Oregon Watershed Enhancement Board, U.S. Fish and Wildlife Service, and non-profit organizations [e.g. local land trusts, The Nature Conservancy, Rocky Mountain Elk Foundation]). In some cases, landowners donate land to particular entities and/or for specific purposes such as education, recreation or conservation. Donation can provide landowners with federal, state, or estate tax benefits. In the case of exchanges, public and private lands are traded to reach mutual goals. These options are only practical when the landowner is willing, funding is available, the new owner is able to take on management responsibility, and the land has high enough conservation values to be worth the cost.

Acquisitions may require significant initial investment, plus there are costs for long-term management and stewardship. Active management may be needed to maintain the values for which the property was purchased. These issues, as well as some other considerations, are discussed later in this chapter.

Landowner Recognition. Motivated landowners are a key element of effective conservation programs. Publicly acknowledging landowners' efforts can provide an added incentive to continue their work and motivate other landowners to participate. Landowner recognition efforts include: profiles in newsletters or on websites, project summaries in annual reports, awards, on-site project signage, and invitations to share knowledge and experience through site visits or other presentations.

Conservation Trading Programs. Conservation trading programs rely on supply and demand to set prices, and allow trading or selling of commodities desired for conservation, such as water rights or pollution credits. The Oregon Department of Environmental Quality has incorporated trading for "oxygen demanding substances" such as ammonia and other stressors, and temperature into permit limits issued to Clean Water Services, a wastewater and stormwater special service district in Washington County. Through the terms of the permit, Clean Water Services is able to fund riparian restoration and flow augmentation rather than installing more expensive, on-site, cooling technologies to meet temperature standards. The Oregon Climate Trust invests funding in projects that offset greenhouse gas emissions from power plants, businesses, and individuals to reduce the level of greenhouse gases in the atmosphere. Funding from this program has been invested in riparian restoration in the Deschutes River Basin.

Managing Lands for Multiple Values. Landowners often can combine habitat conservation with agriculture, timber production and other uses, sometimes creating new economic opportunities. For example, agri- and eco-tourism allows farmers to market the habitat value of their land by offering recreational services to anglers, hunters, bird watchers, and other fish and wildlife enthusiasts.

Heritage Seedlings, Inc. provides another example. Mark and Jolly Krautmann are involved in a variety of stewardship efforts on several rural properties in Marion County. Activities include extensive restoration of oak woodland, oak savanna, upland and wet prairie, and riparian areas, with assistance from their restoration ecologist, Lynda Boyer. The Krautmanns also have a commercial operation with seven acres of native upland seed plants, including rare plants. The seeds are used for their large-scale restoration projects and also available for others doing similar work. Mark Krautmann, former president of the Oregon Association of Nurseries, believes the nursery industry is uniquely placed to play a substantial role in the restoration and recovery of wildlife habitats and native plant species. He promotes the concept of having a commercial operation that is beneficial to fish and wildlife habitat.

Regulatory Assurances for Federal Endangered Species Act.

A landowner can voluntarily enter into an agreement with the U.S. Fish and Wildlife Service or the National Marine Fisheries Service and receive certainty that these agencies will not impose additional land use restrictions related to the Endangered Species Act in the future. Safe Harbor Agreements are for landowners who want to conserve listed species on their property. Habitat Conservation Plans are for landowners who want to proceed with an otherwise legal activity that will result in the “taking” or killing of a listed species. “Incidental take” is permitted if the plan specifies actions to minimize and mitigate the effects. Candidate Conservation Agreements are for landowners who want to conserve species that are proposed for listing and thereby help prevent their decline and the need for listing. If certain standards can be met, landowners can be provided assurances that additional regulations will not be imposed due to their actions to benefit species.

Regulatory and Administrative Streamlining.

A landowner whose conservation actions go above and beyond regulatory requirements can enter into an agreement with a participating agency and in return receive regulatory certainty, expedited permit processing, higher priority access to other programs and other benefits. An example is “stewardship agreements,” defined in Oregon statutes as “an agreement voluntarily entered into and signed by a landowner, or representative of the landowner, and the state Department of Agriculture or the state Board of Forestry that sets forth the terms under which the landowner will self-regulate to meet and exceed applicable regulatory requirements and achieve conservation, restoration and improvement of fish and wildlife habitat or water quality.” House Bill 3616, passed by the 2003 Oregon Legislature, removed Stewardship Agreements from the Forest Practices Act statutes and created a new Stewardship Agreement Statute, Oregon Revised Statute 541.423. The new statute directs the Board of Forestry and Department of Agriculture to jointly develop rules that address both forest and agricultural lands.

Tax benefits (income tax credits, income tax deductions, property

tax benefits): Income Tax Credits - Income tax programs provide a means for landowners to receive a tax credit for part or all of the costs of a conservation activity. Because such programs reduce state income, they are most appropriately used to achieve statewide conservation objectives rather than strictly local objectives. Income Tax deductions - Landowners who permanently donate land, conservation easements or water rights may be able to deduct the value of the donation from their federal or state income

tax. Property Tax Benefits - In Oregon, property taxes on agricultural and forest lands are assessed at below-market rates, providing financial incentives for property owners to maintain these land uses and to discourage scattered development. Tax-based conservation programs also assess lands at reduced levels, allowing landowners to participate in conservation activities without losing tax benefits. Programs that reduce property taxes reduce revenue for counties and tax-supported special districts. If landowners were already participating in a special assessment program their property tax level usually won't change. Therefore, these programs generally do not further reduce county or district revenue.

Technical Assistance. Landowners may need assistance identifying programs; finding expertise, understanding regulations, developing conservation plans, applying for permits or programs, coordinating with other agencies and designing specific conservation elements. Sometimes technical assistance is the landowner's only need. Assistance is available through a variety of public and private sources, including agencies, watershed councils, soil and water conservation districts, extension agents and consultants.

Building on Success: Some Recommendations for Improving Current Incentive Programs

While the current tools and programs for implementing conservation provide many good options for landowners, many could be improved to more effectively meet fish and wildlife conservation needs. With the number and variety of programs available, landowners have choices and flexibility. However, there are few statewide programs that provide compelling incentives for landowners in conjunction with addressing high priority conservation goals with a multi-species or habitat approach.

Some states have formed advisory committees to recommend changes to state incentives programs. Other states have introduced legislation to create new programs or adjust existing programs. Recently, agency task groups and private organizations have evaluated some of Oregon's programs. This chapter builds on those efforts.

Effective voluntary programs consider a range of factors. Ideally, effective programs would be adaptable to the needs of individual landowners, unique ecological conditions and strategic conservation goals. For landowners, effective programs would be easy to access, understand, and offer desired benefits. They are not one-size-fits-all but offer options for customizing programs to specific parcels of land. For species and habitats, effective programs would be consistent with statewide and local conservation goals, cluster efforts and effects across scales,

and provide long-term conservation benefits. In addition, programs should provide for monitoring to measure effectiveness and encourage adaptation.

A. Ten Opportunities to Help Prioritize Efforts and Leverage

Resources - The following list identifies ten of the biggest opportunities to help prioritize efforts and leverage resources in Oregon. For some programs, state or federal legislation directs incentive program priorities. These programs were created with different purposes, guiding mandates, geographical areas, as well as different constituents they are supported by and created to serve. Although any modifications to these programs will need to work within the legislative intent, there are opportunities to increase conservation benefit while meeting programs' primary purposes. The extent to which programs can be adapted to support implementation of the Conservation Strategy will vary. Some desired approaches may need state or federal legislation to modify existing conservation programs, authorize specific conservation programs, create new funding sources or comprehensively organize voluntary conservation tools. This would require the support of diverse constituencies at the local, state, and federal levels.

1. **Focus on conservation goals** – *Align incentive programs with regional and statewide conservation goals, plans, and priorities.*

Program goals and project prioritization are not coordinated with regional or statewide habitat conservation plans. Individual landowners or agency staff can tailor programs to address at-risk habitats, but most programs do not approach conservation goals systematically. This Conservation Strategy provides an excellent opportunity for aligning existing voluntary conservation programs with ecoregional and statewide habitat priorities and focusing on conservation goals.

2. **Focus on multiple key habitats and species** – *Increase the breadth of habitats and species addressed in existing incentive programs.*

There is a strong tendency for habitat conservation programs in Oregon to emphasize aquatic species and habitats, leaving upland habitats with little attention or funding. This is a result of regulatory efforts and voluntary programs on threatened and endangered salmonids and on water quality issues. While programs focused on water quality and listed species provide conservation benefits many Strategy Species, a broader habitat-based approach could broaden the benefits to multiple species.

Other landowner assistance programs focus on landowner goals such as crop production, soil or water conservation, or reforestation. For these programs, habitat conservation is absent or a secondary goal. Depending on individual program's legislative purpose and goals, there may be opportunities to increase the direct and indirect contributions to conservation goals, while meeting original program intent. A prioritized habitat-based approach allows for the conservation of multiple species. However, certain species may need special management attention on an individual basis.

3. **Be strategic rather than opportunistic in program**

delivery – *Focus investments on Strategy Habitats, Strategy Species, and in Conservation Opportunity Areas. Cluster efforts where habitats or issues cross ownership boundaries. However, make some programs available to interested landowners across the state, including those outside of priority areas.*

Most programs have no process for selecting participants based on priority habitat types or conservation areas. Instead, they accept any interested landowner who meets eligibility requirements. Some programs prioritize projects, but have no mechanism or adequate funding for clustering participation in high priority areas. With limited funding, opportunistic approaches have been cheaper and easier to administer.

Implement programs at appropriate scales to achieve conservation goals, clustering focus areas at the landscape scale. When compatible with program intent, focus investments on Strategy Habitats and in Conservation Opportunity Areas. This will require decisions on funding levels for rural versus urban conservation efforts; for conservation on private versus public land; for incentives versus acquisition; for restoration versus conservation; for conservation actions versus monitoring; and for one habitat versus another. These decisions need to accommodate diverse conservation programs and approaches specific to each Strategy Habitat.

As an example, Oregon Department of Fish and Wildlife's Landowner Incentive Program (www.dfw.state.or.us/LIP) has already begun incorporating priorities identified in this Conservation Strategy into its process for evaluating future grant applications. The Landowner Incentive Program is considering focusing efforts on specific Strategy Species and Strategy Habitats each year. This could increase conservation activity that connects high quality habitats and target technical assistance to a geo-

graphic area and/or habitat type each year. Landowners in that area could plan and implement compatible projects together and to learn from each other.

Also, the Oregon Watershed Enhancement Board has developed policies and procedures to make its funding decisions more strategic. For example, it recently developed restoration and acquisition priorities (www.oregon.gov/OWEB/GRANTS/index.shtml). In addition, the board has been coordinating with other agencies to ensure programs and priorities are consistent between agencies. This Conservation Strategy can help the board further align funding priorities with statewide conservation goals for species and habitats. As the Oregon Watershed Enhancement Board sets statewide priorities consistency at the local level will be important for all of their grant programs.

When implementing the Conservation Strategy, partnering with watershed councils, land trusts and conservation organizations will provide other opportunities for strategic evaluation of projects and conservation investments.

However, encouraging broad participation in the Conservation Strategy requires that conservation opportunities are available for Oregonians throughout the state. Use “strategic opportunism” in identifying potential participants, and make some programs available to interested landowners outside of priority areas, to encourage conservation actions throughout Oregon, especially to link Conservation Opportunity Areas together.

4. Provide monitoring of ecological outcomes – *Learn what works and adapt accordingly at both the project and programmatic levels.*

Program monitoring is often limited to counting people, acres, or trees. Some programs encourage or require monitoring for individual projects such as survival of planted trees. A few programs or agencies may measure local habitat outcomes, such as shade from planted trees, water quality after riparian restoration, or flow increases from water conservation. No programs or agencies adequately monitor desired habitat outcomes.

Monitoring of voluntary conservation tools needs to have two purposes: 1) evaluate effectiveness of program delivery and contributions to toward conservation goals, and 2) evaluate effectiveness of on-the-ground conservation actions. Establish desired outcomes and monitor to evaluate progress at local,

regional and statewide scales. Adaptive management approach is needed at both the program and project levels to regularly adjust approaches to improve effectiveness. The Conservation Registry discussed below can assist with monitoring for both purposes. For complete recommendations for monitoring and a discussion of adaptive management, see Monitoring for Success on pages 99 to 103.

5. Improve coordination between agencies, programs, and partners – *Build on existing partnerships between agencies to strengthen coordination, review programs, streamline processes, assist landowners, and share information.*

A wide variety of agencies deliver conservation programs, each with its own objectives, messages, and target audience. This lack of coordination makes the universe of conservation programs complex, confusing, and inaccessible for landowners. It is important to recognize that programs were created for and supported by different constituencies and have may have guiding legislation that determine program priorities. However, there are opportunities to build on existing partnerships between agencies to strengthen coordination. This Conservation Strategy can be a tool to prioritize funding decisions. Coordination can be improved through a “one-stop shopping” approach of delivering incentive programs and technical assistance. This concept is presented in greater detail below, in New Conservation Tools and Programs.

6. Provide adequate funding – *Develop stable, long-term state and federal funding sources. Carefully prioritize efforts to make best use of existing funds. Take advantage of underutilized federal programs available to Oregon.*

The majority of state and many federal programs are underfunded. Lack of continuity of programs and coordination between partners hinders the effective use of available funding. This leads to implementation based more on convenience than targeted conservation goals and priority areas. State funding for the Oregon Watershed Enhancement Board cannot address all of the state's conservation needs.

This Conservation Strategy depends on proactive development of conservation programs with stable, long-term state and federal funding. Focusing funding on programs that implement Conservation Strategy conservation goals and priorities can make efficient use of limited funds. Also, improved coordina-

tion will increase the effective use of limited current funds but current funding is not enough.

New funding sources need to be developed, particularly involving private businesses and community groups. A Flexible Incentives Account created by the state legislature in 2001 to fund innovative conservation projects has yet to be funded. This opportunity is discussed later in this chapter. Build on existing creative funding partnership including the work done by watershed councils, Rocky Mountain Elk Foundation, Ducks Unlimited, Oregon Hunters Association, Audubon Society, The Nature Conservancy, and Joint Venture programs. These organizations contribute matching funds, large numbers of hours and other in-kind efforts, and are highly committed to the success of their projects. Their efforts can be leveraged for grant applications and other funding sources.

7. Increase program participation – *Increase landowner involvement by including them in decision-making processes, increasing flexibility, and conducting outreach to increase awareness.*

Participation in some Oregon programs is below capacity, reducing ability to reach conservation goals. Some landowners are unaware of programs, feel that programs are not flexible enough, and/or do not trust government agencies or conservation organizations delivering programs. Landowners may perceive program delivery as top-down. Other landowners are wary of legal implications of programs that affect federally listed species. Other landowners are reluctant to take conservation actions that might attract federally listed species to their property. Some programs do not provide enough financial incentive, for example property tax programs. Not all programs are available to all interested landowners. For example, the Wildlife Habitat Conservation and Management Program is available only in participating counties. Many programs require landowners to bear the cost of the project until they are reimbursed.

To address these issues, include landowners as local partners and decision makers, providing them a role as stakeholders and increasing their commitment to success. Increase flexibility to accommodate landowners' individual needs, balancing flexibility with consistency and compliance requirements. Improve outreach to increase landowner awareness of programs. Outreach efforts can be integrated into individual program administration and into coordination efforts between agencies and programs. Encourage peer learning and participation through landowner recognition, demonstration projects, and landowner groups.

Provide short-term loans to cover reimbursable costs until cost-share payments are received. Evaluate and remove disincentives in existing programs.

In some cases expanding program availability is needed to increase program participation. Oregon's Wildlife Habitat Conservation and Management Program (www.dfw.state.or.us/lands/whcmp_overview.html) is currently limited to the 14 participating counties. With the support of local landowners and community leaders, this program could be expanded to other counties and focused on Strategy Habitats.

8. Simplify complex administrative processes – *Where possible, improve administrative efficiency, simplify paperwork, standardize application forms and processes between programs, streamline processes, increase assistance to landowners in filling out forms and meeting regulatory requirements, empower landowners to manage projects through training and networking, and ensure deadlines are reasonable for landowners.*

Most conservation programs require a significant investment of time to develop plans, keep records, fill out applications, work with agencies and track budgets and reimbursements. Landowners face a daunting challenge completing paperwork and receiving approval from a plethora of agencies or foundations, each of which may have different formats, goals, criteria and monitoring standards. Deadlines often occur at difficult times of the year.

To address these issues, simplify paperwork whenever possible, while ensuring that enough information is collected to ensure accountability and project documentation. Standardize application forms and processes where feasible. Seek ways to provide technical assistance with applications and records. Provide information, training, and networking to empower landowners to manage their own projects. Set deadlines to increase convenience to landowners.

9. Provide more technical support – *Build on existing programs to provide biological and administrative advice and assistance.*

Lack of adequate technical assistance undermines participation in and success of voluntary conservation programs. Technical assistance is severely under-funded, and there is little coordination of efforts. The availability of federal technical assistance does not meet demand from federal Farm Bill programs. As a

result, landowners may not participate. Soil and Water Conservation Districts and watershed councils currently provide assistance, but do not have the funding to fully support landowner requests. In some cases landowners do not ask for financial assistance but only need technical support. Landowners need assistance with planning, funding and permit applications, coordination with partners, record keeping, engineering design, implementation, and monitoring.

Provide technical support to landowners through conservation programs. Improve technical assistance by analyzing program needs and asking landowners for ideas, seeking private sector assistance from natural resource consultants, look for new funding sources, and partnering with entities already working successfully to provide technical services, such as Soil and Water Conservation Districts and Oregon Plan for Salmon and Watershed programs.

ODFW's Western Oregon Stream Restoration Program provides a prototype for landowner assistance programs and in coordination with local communities. Under this program, Oregon Department of Fish and Wildlife field biologists provide direct technical support to watershed councils and private landowners to implement the Oregon Plan for Salmon and Watersheds. Technical support includes pre-project assessment, design, assistance with grants, permits, implementation and effectiveness monitoring. A similar group of ODFW field biologists could provide technical assistance to community and landowner groups to implement the Conservation Strategy. The statewide technical assistance program could also include providing direct restoration services for landowners with high priority habitats, with department staff or consultants doing the actual work. This program would allow ODFW to have direct access to habitats of high conservation need and to determine the specific restoration methods used.

10. Look for ways to increase staffing – *Provide adequate funding to attract and retain program delivery staff over time.*

Some agencies may not recognize the full suite of technical and social skills needed for effective program delivery. Instead they hire staff with good technical skills, or shift staff into program delivery. Lack of funding undermines agency hiring flexibility, as well as staff compensation and satisfaction. High staff turnover limits community integration. Staff time is limited and funding constraints can limit both supporting all the worthy projects as well as providing adequate program oversight and administra-

tion. Greater coordination and landowner support that supplements and does not detract from the work of program-specific staff. Solutions must ensure highly efficient use of limited staff time.

Provide adequate funding to attract and retain effective program delivery staff with diverse technical and social skills. Staff must be knowledgeable in selecting appropriate programs to meet landowner's priorities, habitats and property features.

B. Federal Funding Sources: Some New Opportunities for Oregon

In recent years, new federal funding or new programs to implement existing funding have become available to Oregon. In some cases, they present brand new opportunities. In other cases, these funding sources have been unused or not used to full capacity. In total, these programs offer several hundred million dollars nationally, which could translate into over \$5 million annually for Oregon.

In accordance with Oregon Revised Statute (ORS 291.375), the legislature must review applications for and approve acceptance of federal grants. Local projects that meet multiple community goals and have high citizen support are most likely to have the greatest support within the Oregon Legislature.

1. *Wetlands Reserve Enhancement Program (WREP)*

www.nrcs.usda.gov/programs/wrep

The Wetlands Reserve Enhancement Program provides an avenue for the Natural Resources Conservation Service (NRCS) to form special partnerships with others to improve or expand the delivery of its Wetlands Reserve Program. The Oregon Watershed Enhancement Board has been asked to develop a WREP proposal for the Willamette Valley as a part of the Governor's Willamette Legacy Program. The proposed Willamette Valley WREP would provide technical assistance and regulatory review for wetlands reserve program projects. The structure would be similar to the federal/state partnership established for the Oregon Conservation Reserve Enhancement Program. The Wetlands Reserve Enhancement Program would bring needed capacity to serve landowners and add to the partnership implementing wetland restoration in Oregon.

2. *Coastal and Estuarine Land Conservation Program*

<http://coastalmanagement.noaa.gov/landconservation.html>

This is a National Oceanic and Atmospheric Administration program for conserving coastal and estuarine lands with significant conservation, recreation, ecological, historical, or aesthetic val-

ues, or that are threatened by conversion. The state of Oregon has not applied for this funding. In 2004, this program had about \$51 million available nationally.

3. *Coastal Wetlands Conservation Grants*

www.fws.gov/cepf/cwgcover.html

This U.S. Fish and Wildlife Service program provides funding for acquisition, restoration, and enhancement of wetlands of coastal states. The state of Oregon applied for and received grants in 2003, but did not apply for 2004 or 2005 funding. In 2005, this program has about \$13 million available nationally.

4. *Cooperative Endangered Species Conservation Fund*

<http://endangered.fws.gov/grants/section6/index.html>

This U.S. Fish and Wildlife Service program provides funding for projects, land acquisition and planning assistance. The state of Oregon has applied annually for funds and has received a relatively small amount of this funding. In 2005, this program has about \$90 million available nationally.

5. *Forest Legacy Program*

National: www.fs.fed.us/spf/coop/programs/loa/flp.shtml

Oregon: <http://159.121.125.11/forasst/Legacy/legacy.htm>

The Forest Legacy Program, a partnership between the U.S. Forest Service and individual states, provides federal funding to protect private forestlands from conversion to non-forest uses, through conservation easements and voluntary land acquisition. Forty-two states are participating although some are still working on their assessment or have applied for but not received project funding. Some have identified their entire state as eligible for the program, an approach that does not focus on conservation priorities.

Oregon is evaluating participation in the program. The state used a strategic assessment process, with a strong emphasis on high priority habitats. Three forest habitats (oak woodlands, riparian bottomlands, and ponderosa pine forests) were prioritized for inclusion in a Forest Legacy Area. The ecological value of the land including priority forest types, high quality examples of forests, priority forest wildlife species, endangered species or their habitat, and riparian habitat were key criteria for screening participation in this program. The Oregon Department of Forestry indicates that before the Forest Legacy program could be implemented, the assessment of need must be updated and compatibility with the statewide land use program determined.

Because of the close alignment between Conservation Strategy and Forest Legacy Area priorities, this program would be a very helpful tool for conserving private forest habitats in Oregon, particularly because there are few such incentive programs. In Fiscal Year 2004, this program received \$71 million of total funding, of which \$64.1 million is new funding and \$6.9 million was to be derived from prior-year funds. See www.fs.fed.us/spf/coop/library/FSLegacy.pdf.

C. Some Other Recommendations for Improving Existing Voluntary Conservation Tools

1. Provide support for landowners in drafting conservation easements.

Conservation easements are a flexible legal instrument that often involve creative partnerships for achieving conservation goals while addressing landowner interests and retaining private ownership. However, they are complex, expensive, and time-consuming to arrange, and there is little funding available for preparing legal documents and agreements, or stewardship of easements.

Partners can seek assistance to cover the administrative costs of preparing an easement, which are very difficult to fund. Non-profit groups such as land trusts can provide services and expertise in this area, but have limited funding and need additional support. Alternatively, a tax deduction can be provided to compensate for preparation costs. Similarly, funding sources can be developed to cover stewardship costs which include land management, monitoring and legal enforcement of the easement's restrictions over time.

2. Evaluate conservation priority, long-term costs, and local support when acquiring land.

Purchasing land is a simple, effective, and permanent way to conserve species, habitats, and other ecological values, while providing financial compensation to interested landowners. Fee title acquisitions may require significant initial investment, plus there are costs for long-term management and stewardship. However, because of the costs and the long-term commitment, land acquisition needs to be used judiciously to ensure that limited conservation funds are invested for the highest conservation priorities.

In many cases, there are complex social, political, and economic factors to consider. How does the current and future owner-

ship fit into the local pattern of landownership? What are the potential land management or economic impacts for neighboring landowners? Will the proposed new landowner/manager be a good steward of the property? Are they willing to actively manage the property if necessary to maintain ecological values? Will they be accepted and trusted by the local community? What are the local economic and social impacts of taking land out of commodity production or shifting land to public ownership? Address these issues on a case-by-case basis, consulting the current and future owners, appropriate agencies and local community members.

As an example, the Oregon Watershed Enhancement Board, the state's principal funding source for conservation land acquisitions, has developed a formal set of priorities for evaluating the merits of proposed land acquisition projects (www.oregon.gov/OWEB/GRANTS/acquisition_grants.shtml). The Board's land acquisition administrative rules, adopted in 2004, give priority to projects that (1) address the conservation needs of priority habitats and species, and (2) are consistent with one or more of a set of specific conservation principles that help focus acquisition investments more strategically. The ecological priorities were derived from the same data sources and are consistent with priorities in this Conservation Strategy. The rules require applicants to demonstrate public support and address the economic and social effects on the local and regional community. This combination of science-based conservation priorities and a rigorous review process provide a solid model for evaluation of conservation land acquisition proposals.

3. Expand Recognition Programs.

According to a landowner who has been involved in many voluntary habitat conservation efforts, "You can't thank people enough. Even highly motivated people like to have their efforts recognized." In addition to existing recognition programs, it is important to develop additional ways to recognize landowners' and other partners' contributions to habitat conservation. There

are uncounted examples of great projects, dedicated landowners, and innovative partnerships that deserve recognition. Many agencies and organizations could expand their recognition efforts.

Publish profiles or case studies of landowners, projects, partnerships or programs in newsletters, on websites, or in annual reports. These publications to peers motivate new participants,

or spark ideas for new innovative partnerships. Broaden public conservation knowledge and interest through newspaper articles, radio interviews and televised profiles. Arrange on-site learning opportunities for other landowners and conservation partners. Offer project signage, identify demonstration sites and invite landowners to share experiences through site visits or workshops. Recognize success and effort with awards, certificates, and plaques.

Recognition helps shift conservation focus from conflict to success. Rural habitat success stories shared with urban audiences help bridge the gaps, both perceived and real, between diverse Oregonians. The person who hears about a habitat conservation success may be the next partner or fundraiser.

Recommendations for New or Expanded Voluntary Conservation Tools

For effective implementation of this Conservation Strategy, Oregon needs to build on existing efforts and develop new programs to meet statewide conservation goals, while addressing complex local and statewide social and economic issues. Some programs will need additional funding or staff. All programs will require creativity, partnerships, and a commitment to improving voluntary conservation tools and programs.

1. Develop business opportunities and other market-based approaches that advance fish and wildlife conservation.

Healthy ecosystems depend on healthy economies, just as healthy economies depend on healthy ecosystems. A growing number of businesses are striving for sustainability by modifying internal practices or supporting outside efforts. A conservation marketplace is appearing in the state. There are new business opportunities for landowners to market products that in turn help conserve the state's fish and wildlife resources. Native plant nurseries, juniper products, sustainably managed timber, organic produce, and certification programs are making conservation profitable.

In some areas, removing encroaching small-diameter trees can restore habitats with historically open understories, while reducing the risk of uncharacteristically severe wildfire by reducing fuel loads and removing ladder fuels. Developing markets for these small-diameter trees can create jobs, contribute to local economies, and help pay for restoration. Strategic investment in restoration projects such as culvert replacement and invasive species control and could also support job creation in some rural areas, while meeting fish and wildlife conservation goals.

These efforts can be further promoted and expanded. They can serve as role models for new innovative economic and marketing approaches.

Landowners can incorporate conservation into other economic uses of their land. Each property has a unique combination of production capabilities, habitats, and other natural features, allowing different possibilities. Oregonians need to encourage and support innovative approaches to land management that allow landowners to meet economic and ecological goals in both rural and urban areas.

The following examples illustrate some ways that landowners and businesses can combine economic and ecologic goals to benefit fish and wildlife.

- Juniper Group: This local partnership in the Prineville area is developing a program to help meet the community's natural resource and economic needs. Western juniper trees are native to central and eastern Oregon and provide wildlife cover, food (berries), and nest sites, and as shade for livestock. Juniper has expanded dramatically in the last half century, probably due to suppression of natural fires, historic overgrazing by livestock, and possibly climate change. Juniper trees use a significant amount of water, reducing moisture available to other native plants, streams, and the water table. Managing them is challenging because they are hardy, out-compete other vegetation and are highly vulnerable to fire. Juniper has no widespread commercial value, because the logs are difficult to process, cure, and plane. Landowners John and Lynne Breese, in partnership with OSU Extension Agent Tim Deboodt, initiated the Juniper Group to address these management and marketing challenges. The Juniper Group is experimenting with ways to turn juniper trees into a marketable product that creates family wage jobs for the community. They will develop a business plan to assist the community in implementing the program.
- Tree of Life Nursery: In 1987, in a vacant lot in Joseph, Oregon, June Davis experimented with growing seeds of native plants she had gathered locally. She had experience with horticultural businesses, but less with native species. The seeds grew, and soon the new Tree of Life Nursery was providing locally grown native plants for U.S. Forest Service riparian restoration projects. Now she supplies plants for other agencies and for private landowners and she provides workshops. In 1995, Davis began working with the Confederated Tribes of the Umatilla to help the tribes set up their own native plant nursery. Now, the tribes grow their own native plants for restoration projects and supply plants for other agencies. The nursery is a profitable business for the tribe, and both nurseries provide opportunities for local community members to gain job skills and to learn to reverse the results of some past land use practices.
- Community Smallwood Solutions (www.ccswood.com) and Wallowa Resources (www.wallowaresources.org): Wallowa Resources, formed in 1996 in Wallowa County, is a partnership that balances and blends the ecological needs of the land with the economic needs of the community. In 1999, Wallowa Resources was among the first groups in the nation to sign a memorandum of understanding with the U. S. Forest Service, with the intention to demonstrate new watershed management projects that improve and restore the ecosystem health of the Wallowa-Whitman National Forest. These projects include: watershed restoration, noxious weed management, fuel reduction and fire planning, development of a pole and post processing facility, timber worker retraining, construction projects with local wood products, education and projects for K-12 students, and classes for university credit. Wallowa Resources owns interest in a local mill and contracts restoration and stewardship work. In addition, it developed Community Smallwood Solutions to develop markets for small-diameter trees removed during fuel reduction and habitat restoration projects. Through these market-based approaches, the organization is making a difference in the long-term economic and ecological health of Wallowa County by creating and maintaining family-wage jobs and business opportunities from natural resource stewardship. This community-based group has become a model for other rural communities. Additional information on community Smallwood Solutions is on pages 80 and 284.
- Salmon-Friendly Power: Customers of Pacific Power and Portland General Electric have the option to pay an extra monthly charge with their electric bill, which goes into the Salmon-Friendly Power Fund (www.portlandgeneral.com/home/products/power_options/habitat.asp). The funds are administered by The Nature Conservancy for on-the-ground salmon habitat restoration grants (www.nature.org/wherewework/northamerica/states/oregon/

[press/press1572.html](#)). The grants can be used to match other federal and state funding sources. Salmon-Friendly Power grants are available for projects in the service and transmission areas of Pacific Power and Portland General Electric.

- Tyee Winery and Buchanan Century Farm (www.tyeevine.com): The Buchanan farm sits on the fertile banks at the confluence of Muddy and Beaver Creeks, in the Marys River Watershed in Benton County. Dave Buchanan is a fourth generation farmer and his daughter plans to be the fifth. In recent years, this Willamette Valley operation has focused on growing wine grapes, filberts, sheep, grass seed, wheat, and hay, and operating the Tyee Wine Cellars. Conservation is a high priority for the family, who has extensive wetlands and bottomland hardwood forests on their property, along with migratory waterfowl, frogs, turtles, native trout, over 100 species of birds, and several rare or threatened species. A 30-year conservation easement through the Wetlands Reserve Program allows the Buchanans to conserve and restore habitat on about half of the 460-acre property while giving the next generation a decision-making role on long term stewardship. The vineyard, with its perennial cover crop and intact riparian buffer, is certified as Salmon-Safe under an eco-label.
- Oak Woodland Restoration (www.mckenzieiver.org/fall_2004.pdf page 3): In 2004, Marilyn Gill donated a 200-acre conservation easement in Douglas County to the McKenzie River Trust to conserving oak habitat for the Columbian white-tailed deer and other special species. The Trust is developing and implementing a restoration strategy for the property that allows the landowners to balance economic and natural values of the land. Restoration is funded through the Private Stewardship Grant Program (U.S. Fish and Wildlife Service) and other sources. The Trust also received a grant to investigate whether small diameter oak trees generated from the oak woodland restoration can be commercially processed into viable wood products, such as poles and posts. The project will generate educational materials for landowners interested in developing a similar project.
- Yannix Ranch, Sprague River Valley, Upper Klamath Basin: This diverse partnership is supporting comprehensive ranchland renewal on a 480-acre ecologically significant property in poor condition due to past management. The goal is to demonstrate that ranches are an

essential component of regional sustainability, providing fish, wildlife, and habitat values, open space, a local food supply, and an economic pillar for rural communities. The partnership includes the new landowners (Becky Hatfield-Hyde and Taylor Hyde, both from multi-generational ranching families), neighboring landowners, federal and state agencies, the Klamath Tribe, and Sustainable Northwest. The partnership has worked to develop a ranch restoration, management, and monitoring plan through respectful dialogue and inclusion of all interests. Two model conservation tools are being developed for this project, with the goal of using these on other lands in the Pacific Northwest. The first tool is a working-lands conservation easement with conditions that are flexible enough to allow opportunities to experiment, learn from the land, and modify management activities, and yet will still give funders assurance that they are investing in conservation. The second tool is a conservation investment program that provides incentives and financial support to ranchers seeking to transition to more sustainable approaches, by linking urban investments to ranch-based restoration.

2. Expand conservation banking to a statewide approach.

Conservation banking has been developed to provide options for regulatory compliance and can be a more simple and economical option for meaningful mitigation for unavoidable impacts, resulting in a win-win outcome if designed well. Today, the concept of conservation banking is expanding, presenting new options. Conservation banking is emerging as a means of financing the conservation and restoration of high priority habitats, in large contiguous blocks, whether regulated or not.

Conservation banking places a dollar value on habitat, establishing "credits" that serve as a currency and are purchased with mitigation fees or voluntary investments, bringing a market approach to conservation. The number of credits available in a conservation bank is based on the bank's acreage, habitat quality, location, and level of restoration needed or completed. Because credit prices are based on supply and demand, profitable conservation banks will attract additional banks into the market, and competition can lower or raise the price of the credits. Banking can thus provide a desirable economic use of priority habitats for landowners.

Mitigation for habitat impacts is required under existing state and federal regulatory programs for a variety of development actions, including transportation projects, hydroelectric projects, energy facility projects and other residential, commercial and industrial development. Mitigation can also be required by local agencies for new habitat impacts from developers or for past and ongoing impacts from rate payers or users. Habitat mitigation has often been done on-site, but the conservation benefits may have been limited due to nearby non-habitat land uses. In addition, mitigation projects often involve construction of new habitat to replace complex ecological systems such as wetlands, a challenging and often unsuccessful endeavor. Depending on local considerations, on-site mitigation may be the most appropriate approach in order to benefit the impacted populations and local habitats. Existing state and federal regulations require on-site mitigation in some circumstances. However, off-site mitigation may be appropriate to achieve larger-scale habitat conservation goals.

Voluntary investments can significantly increase a bank's capacity to meet key habitat conservation needs. Agencies, organizations, or individuals who are interested in contributing to habitat conservation efforts, but do not have access to other high priority conservation opportunities, can invest in conservation banks. Carbon sequestration is one of the newer and now fairly well established forms of conservation banking in which power utilities purchase credits for forests (which absorb and store carbon dioxide) in exchange for permission to release carbon dioxide into the atmosphere. All of these investments increase the ability of the conservation banking system to purchase or manage larger blocks of habitat.

A statewide system of conservation banks would provide a tool for implementing this Conservation Strategy and for achieving statewide habitat conservation goals. Working at the state level allows the banking system to be flexible by receiving mitigation fees and voluntary investments from parts of the state where habitat impacts occur and by developing conservation banks in areas with the highest priority conservation needs. The Conservation Strategy recognizes there are ecologically significant values in both rural and urban areas and prioritization regarding where to invest in conservation banks should take those values into account. The statewide conservation banking system could allow off-site (away from the impact) banking perhaps with an ecoregion focus while other banks could be closer to the project site (same or nearby watershed). Currently, state and federal

requirements for mitigation banks do not always provide this flexibility.

Conservation banks can be in-kind (same or similar habitat type) in order to replace lost ecosystem services. In many cases it may be desirable to make out-of-kind (different habitat type) investments when there is opportunity to trade a more common habitat type for an extremely rare one such as Willamette Valley prairie. The statewide conservation banking system would need to balance the benefits of conserving the highest priority habitats (regardless of location and type impacted) with the benefits of replacing impacted habitat with the same habitat and in close proximity.

Careful planning, coordination and management will be needed to create an effective, flexible statewide conservation banking system. Significant coordination will be needed between agencies that set conservation goals, potential and actual conservation bank owners and managers, and agencies or organizations that contribute mitigation fees or voluntary funds toward credits. One or more agencies or organizations would need to take responsibility for coordination, program management, habitat management, measuring performance, monitoring, reporting, and fiscal management.

3. Seek Funding Opportunities for Oregon's Flexible Incentives Account.

Voluntary conservation tools require adequate funding, and new tools need start-up investments. In 2001, the Oregon Legislature created a Flexible Incentives Account to provide flexibility in funding innovative projects that implement statewide, regional, or local conservation plans. The account can receive private or public funds, and is administered by the Oregon Watershed Enhancement Board. To date, no funds have been committed to the Flexible Incentives Account. However, there are opportunities to fund the Flexible Incentives Account through donations, business partnerships, and pooling resources. If funded, this account could be used to launch new programs or support revision of existing programs to meet statewide priorities.

If funded, the Flexible Incentives Account could be an important tool to implement the Conservation Strategy by using the account to target Strategy Habitats or Species. Alternatively, it could target comprehensive efforts such as large-scale floodplain restoration at a scale that can provide significant

benefits for fish, wildlife, and humans (such as Willamette River floodplain restoration).

4. Develop and expand local citizen-based partnerships to maximize citizen involvement and support.

Local partnerships involving diverse interests have evolved in many parts of Oregon. In some cases, partnerships have formed to cooperatively restore habitats or address other local natural resource issues. In other cases, partnerships have formed as a peaceful alternative to years of conflict. Community-level partnerships include diverse public and private interests and strive to address the ecological, economic, and social issues that cross ownerships in a local area. Smaller partnerships may focus on a specific project or habitat. These partnerships can engage Oregonians, strengthen communities, increase information sharing, help plan and implement conservation projects, and come up with innovative solutions. Communities are stronger when they come together to address shared interests.

The following examples illustrate some local citizen-based partnerships:

- Watershed Councils (www.oregon.gov/OWEB/WSHEDS/wsheds_councils_list.shtml): Watershed councils are locally organized, voluntary, non-regulatory groups established to improve the condition of watersheds in their local area. The 1995 Legislature unanimously passed House Bill 3441 providing guidance in establishing watershed councils but making it clear that formation of a council is a local government decision, with no state approval required. Watershed councils are required to represent the interests in the basin and be balanced in their makeup. Watershed councils offer local residents the opportunity to independently evaluate watershed conditions and identify opportunities to restore or enhance the conditions. Through the councils, partnerships between residents, local, state and federal agency staff and other groups can be developed. Through these partnerships and the resulting integration of local efforts, the state's watersheds can be protected and enhanced. Watershed Councils provide critical technical assistance, information and training, project management, and coordination for habitat conservation efforts in their community. Additional funding and support is needed for these groups to improve their capacity to deliver programs and projects on local private and public lands.
- Applegate Partnership (www.grayback.com/applegate-valley/ap/partnership.htm): In 1992, an environmentalist and a logger in southwest Oregon discovered common ground in a climate of animosity over natural resources. They initiated an experiment in collaborative management with community members, federal agencies, timber interests, local businesses, and environmentalists to focus on common goals rather than affiliations or positions. Soon, the Applegate Partnership had a board of directors, a vision, goals, and objectives. The Partnership supports management of all land in the watershed in a manner that sustains natural resources and that contributes to economic and community stability. Leadership is shared, decisions are made by consensus, and participation is high. The Partnership has focused on two challenging forest issues: overcrowded forests that are vulnerable to insects and fire, and high unemployment of timber workers due to logging injunctions and mill closures. The collaborative approach avoids the use of litigation, allowing the local community to suffer fewer impacts in lost jobs, divisive issues, and unhealthy forests. The Partnership also is involved in decisions about management of local federal land, allowing local social issues and priorities to be incorporated, and improving the relationship between the community and federal agencies.
- Local Resource Advisory Committees: Under Title II of the "Secure Rural Schools and Community Self-Determination Act" of 2000, federal money is available for distribution to projects meeting objectives that include: watershed restoration and maintenance; improvements in forest ecosystem health; restoration, maintenance, and improvement of fish and wildlife habitat; and invasive plant control. Eligible projects must be on federal lands or adjacent lands (including private lands) where projects would benefit federal lands. The act set in place a structure for cooperative working relationships among the people who use and care about public lands and the federal agencies responsible for managing these lands. Through Resource Advisory Committees, community members including counties, state and local governments, watershed councils, individuals, private and non-profit entities, and landowners work closely with federal agencies to develop and approve projects. In many parts of rural Oregon, the Resource Advisory Committee process has served as a catalyst to bring together diverse groups and individuals with the shared goal of improv-

ing the condition of public lands. In addition, the process provides an important funding source for cooperative projects. Multi-year funding is possible. Any person, organization, or agency interested in submitting such a project for funding may do so, ideally in coordination with the local U.S. Forest Service staff.

- o Trout Creek Working Group (www.mtnvisions.com/Aura/tcmwgrup.html): The Trout Creek Mountain area occupies nearly a quarter-million acres in Harney and Malheur counties, mostly managed by the Bureau of Land Management, in the southeastern corner of Oregon. The creeks are home to the endangered Lahontan cutthroat trout, as well as a source of irrigation water for the ranches scattered around the base of the mountains. The area has a 130-year history of summer livestock grazing by family-owned ranches that also produce wild hay and alfalfa on their flood-irrigated meadows. By 1988, cutthroat trout habitat was severely degraded due to grazing and some ranchers were about to lose their permits to graze cattle in the mountains. Several ranchers and Bureau of Land Management staff met to discuss range management solutions. As a result the Trout Creek Working Group was formed in 1988, bringing together the ranching community, environmental groups, and the Bureau of Land Management to preserve the land, cutthroat trout, economy, and ranching culture of the Trout Creek Mountains. By working in partnership through consensus the diverse members developed new grazing management systems to reestablish riparian vegetation and fish habitat. By the mid to late 1990s, the riparian vegetation and cutthroat trout populations had recovered, and local ranchers are still grazing their cattle on the mountain. The Trout Creek Mountains are very remote, so the group now only meets once a year to tour grazed areas and see first-hand if management objectives are being met, then re-evaluate the management plan as needed. The Trout Creek Working Group has served as a model for a collaborative process adopted by the Bureau of Land Management and other federal and state agencies.

5. Engage and support local multi-purpose approaches.

Local governments play a role in assessing and conserving habitats in their jurisdiction, under statewide planning goals. Some local governments are also interested in additional conservation and restoration of natural areas to meet community needs for recreation and quality of life. Oregon Department of Fish and

Wildlife and other conservation partners could support local governments undertaking projects to conserve priority habitats by providing technical assistance about conservation tools available for public or private land or matching funds.

Two habitat conservation efforts with significant involvement of local governments are outlined below.

- o Metro: Metro is the directly elected regional government that serves over 1.3 million Oregonians in Clackamas, Multnomah, and Washington counties, and the 25 cities in the Portland metropolitan area. Metro works across jurisdictional boundaries to conserve open space, parks, and habitat, to plan for land use and transportation, establish a region-wide urban growth boundary and to manage garbage disposal and recycling. Metro is developing a fish and wildlife habitat conservation plan that integrates the community's need for a strong economy with the need for healthy habitats that provide valuable ecosystem services such as regulating floods, improving water quality, and habitat for fish and wildlife. The fish and wildlife habitat program includes an inventory and map of regionally significant habitat (completed), an analysis of the economic, social, environmental, and energy impacts of protecting / not protecting habitat (completed), and a regional habitat protection program (in progress). The habitat protection program will focus on incentive-based, voluntary stewardship programs such as: technical assistance, grants, willing-seller acquisition, property tax reduction programs, alternative development practices, and tools for protecting habitat during development. Regulatory protection is limited to about 38,000 acres of the highest value riparian habitat, some of which is already protected. Metro will seek voter approval of a bond measure to support habitat acquisition and restoration by November 2006. A successful 1995 bond measure has allowed Metro to purchase over 8,000 acres of greenspace in the region.
- o West Eugene Wetlands: The area west of Eugene was once dominated by a mosaic of wet prairies, grasslands and braided creeks. Over time, land use conversion, flood control projects, fire suppression and non-native plants impacted the quality and quantity of habitats, yet the area remained critical for a variety of wildlife. To provide for a comprehensive approach to wetland management and a coordinated approach to development, the City of Eugene and Lane County adopted the West Eugene

Wetlands Plan in 1992. The plan was also adopted by the Oregon Department of State Lands and the U.S. Army Corps of Engineers in 1994. It was the first wetland conservation plan of its kind adopted by state and federal agencies in the United States. Under the umbrella of the plan, the City of Eugene, U.S. Bureau of Land Management, The Nature Conservancy, and five other partner organizations continue to provide recreation and education programs; operate a wetlands mitigation bank to satisfy mitigation requirements for local development projects; acquire wetlands and adjacent uplands; collect native seeds; and plan, implement, maintain, and monitor restoration projects. Recent efforts include the Meadowlark Prairie restoration project, which restored 400 acres of prairie, wetland and riparian habitats between 1999 and 2002. New viewing overlooks, picnic areas, interpretive materials, and bike paths allow visitors to enjoy and learn about Eugene's wetlands.

6. Provide "One-Stop Shopping" for delivery of incentive programs.

Some landowners are unaware of programs, while others are confused and frustrated by the alphabet soup of programs and agencies. No single agency or organization provides knowledge of or access to the full selection of programs, and landowners aren't likely to research programs on their own.

In an ideal world, there would be a statewide system offering centralized funding and technical assistance for all conservation programs. Due to logistical and legal limitations, this may be difficult to achieve. However, there is a need and opportunity to coordinate programs, identify common goals, reduce redundancy and resolve conflicts between programs. Through "one-stop shopping" agency staff, extension agents, local organizations, and/or consultants could serve as liaisons between programs and landowners, providing technical and administrative assistance as needed. Liaisons would need to have diverse technical, social, and coordination skills plus local knowledge and good connections with agencies and organizations offering conservation programs. They would use Conservation Strategy goals to identify high priority projects and landowners. The liaisons could approach key landowners and work with them to bundle different incentive programs as needed to address specific habitat, economic, and other circumstances. Interested landowners could fill out one simple pre-screening application that the liaisons would use to evaluate habitat conservation

opportunities and determine programs the landowner could use. The liaisons would continue to assist some landowners in the application and implementation phases of conservation projects, while other landowners might be referred directly to other agencies offering specific programs.

Designing and delivering "one-stop shopping"

There are various models for how to design and deliver this service, some of which could be combined to create a more effective program. With any one-stop shopping model, several issues should be addressed to ensure effective program delivery and technical assistance:

- Trusted Source: Landowners need to trust the person and organization from which they receive information. Some landowners trust government agencies. Others may prefer to work with an extension agent, Soil and Water Conservation District staff, watershed council, agricultural or timber organization, or landowner group.
- Agency Support: Agencies and organizations that currently deliver programs need to support the new system. One-stop shopping will shift the first contact for many landowners away from the agency offering the program. Some agencies will be grateful for the assistance while others may perceive that they are giving up some control.
- Funding: Additional funding will be needed to provide program delivery and technical assistance services beyond those currently available.
- Information Format: A collaborative service needs to produce user-friendly information in several formats to suit the needs and capabilities of diverse audiences. These include a website with summaries of programs, hard copies of the same information, and knowledgeable staff available by phone and in person.
- Organizational Capacity: Agencies or organizations providing one-stop shopping need adequate organizational capacity to use staff and financial resources efficiently and effectively.
- Statewide Coordination: Centralized service delivery requires consistency across the state and a strong tie to Conservation Strategy goals.

Delivery options:

- Organizations That Work with Landowners: Existing agencies or organizations that work with landowners (such as government agencies, watershed councils, land trusts, soil and water conservation districts, extension

offices, irrigation districts, or other landowner groups) could provide one-stop shopping. Their services would be funded through a combination of existing and new funding. Local preferences, office locations and other factors may require that the same simplified access to programs be provided by different agencies or organizations.

Ducks Unlimited is a good example of a conservation organization that provides access to incentive programs. Dedicated to conserving and restoring wetlands and wetland wildlife, Ducks Unlimited establishes relationships with landowners who might use the Wetlands Reserve Program, and provides technical assistance throughout the planning, application, and implementation process. They provide some of the design and restoration services, which are paid for by the Wetlands Reserve Program.

- OSU Extension Service: One-stop shopping could be provided in extension offices, which are widely used, trusted by many landowners and located across the state. However, conservation incentive programs are not the current focus of extension, and staff have other commitments. Rather than hiring new staff across the state, one statewide position could be designed to provide program information to landowners, other extension agents, watershed councils, and other conservation partners. This person would refer interested parties to other agencies and organizations for their funding and technical assistance.
- Private Sector: Local consultants paid by existing program funding and additional one-stop shopping funding could open opportunities for innovation within the private sector. Teams of consultants with a range of expertise would expand services, offering technical assistance in planning, design and implementation.
- Oregon Department of Fish and Wildlife, Oregon Watershed Enhancement Board, Natural Resource Conservation Service, U.S. Fish and Wildlife Service, Soil and Water Conservation District, or other agency: These agencies all provide financial and technical assistance to landowners. Having a single agency take the lead could offer centralized simplified service at locations throughout the state or work within other state and federal agency offices in Oregon. This has potential to coordinate statewide and ecoregional conservation goals with other agencies' conservation programs.
- Inter-agency Habitat Teams: Sometimes a landowner or a group of landowners undertake a complex project

and would like assistance from people with a variety of expertise and experiences. In these cases, an inter-agency habitat team could visit landowners on their property to offer advice and gain local knowledge about habitat conservation opportunities. The team would represent various state and federal agencies and other conservation partners, and ideally would have a mix of technical expertise, from hydrology to soils to botany to wildlife ecology. The team's visit could be coordinated with a group of neighboring landowners who share similar habitats, circumstances or goals. The team's visit would allow the agencies to assess the property's conservation opportunities, the landowner's interests, and make recommendations about incentive programs and other assistance. In addition, the team could provide technical expertise from a variety of backgrounds. This approach would require a coordinator to identify landowners, arrange site visits, synthesize the recommendations, and provide technical assistance for the landowner(s) to implement projects.

First Steps to Implement "One-Stop Shopping:"

Creating a statewide system of "one-stop shopping" will require extensive coordination and planning. In the meanwhile there are immediate steps that will assist landowners and move agencies toward the goal of centralized service.

- Provide outreach on existing programs: Create a comprehensive listing in easily understandable and usable format so landowners could more easily find programs based on their situation. Provide the listing in print and web-based media.

Work with existing clearing houses to update program listings, since information can change frequently. For example, Boise State University manages a searchable database of funding resources for watersheds (<http://efc.boisestate.edu>). The Federal Catalog of Domestic Assistance has a database of all federal programs available to state and local governments; Native American tribal governments; private profit and nonprofit organizations and institutions; specialized groups; and individuals (<http://12.46.245.173/cfda/cfda.html>). Some agencies currently maintain comprehensive summaries of their own programs. One example is the U.S. Fish and Wildlife Service's "Grants-At-A-Glance" website (www.fws.gov/grants/). Other agencies provide links to various grant opportunities. Examples include Oregon Department of

Agriculture (www.oregon.gov/ODA) and NOAA Fisheries (www.nmfs.noaa.gov/habitat/restoration/funding-opportunities/nonfunding.html).

One example of web-based technical assistance is the Missouri Conservation Assistance Guide (<http://outreach.missouri.edu/mowin/conseguide2/guide.htm>). The Missouri Extension Service has developed an interactive web-site that allows landowners to easily explore the range of federal and state assistance programs available for different types of conservation projects. Landowners can learn what programs might be most useful to them by selecting options on what resources they want to conserve, specific management practices, or types of assistance.

- Consolidate ODFW landowner assistance programs within one administrative unit. Look for opportunities to combine programs with similar goals or to re-organize existing staff to bring incentive programs into one administrative section. Some consolidation of landowner incentive programs has occurred within the Wildlife Division of Oregon Department of Fish and Wildlife. As a key player in implementing this Conservation Strategy, Oregon Department of Fish and Wildlife needs adequate staffing to coordinate, manage, support, and track habitat conservation efforts. One option would be to fund a statewide coordinator position or organize a coordination team to ensure that funds are distributed appropriately to watershed councils, conservation districts, extension agents, weed boards, industry and commodity groups, and conservation groups.
- Work with state and federal agencies, landowners, and organizations to explore options for creating and sustaining “one-stop shopping” for incentive programs in Oregon.

7. Create a statewide registry for tracking conservation actions and programs

The state of Oregon needs to develop a comprehensive registry for tracking all habitat conservation actions and programs in Oregon on private and public lands. It is critical for the state and conservation partners to quantify and map the use and distribution of each habitat conservation program tool. This will allow agencies and conservation partners to track, analyze, and understand amounts and patterns of participation in habitat conservation actions and programs, and to target funding to address unmet conservation priorities.

In addition to monitoring at the programmatic level, the statewide registry could be useful for monitoring project success and sharing information to support adaptive management (see sidebar).

The statewide conservation registry would include a database and mapping capability so the information can be displayed and manipulated using a geographic information system. To ensure that the registry provides useful information, careful thought is needed regarding information content and access capabilities. The database and mapping tool need to be accessible online, with an interactive, user-friendly format for adding new information and the means to select and display chosen information. The availability and purpose of the database and mapping tool need to be communicated to federal, state, and local agencies and to private organizations. To maximize use of the system, reporting can be incorporated into the administration of each incentive program. In addition, when federal agencies report their program activities in Oregon for national tracking, they can provide the same information to the state.

Program delivery staff, policy makers, or conservation organizations can use the database to answer question such as:

- Where (which ecoregion, watershed, or habitat type) has a specific conservation tool been used in Oregon?
- What conservation actions have occurred on a specific priority habitat type, and where?
- How and where has a specific incentive program been implemented, and does delivery need to be more strategic in the future?
- Which landowners have participated in conservation actions in a specific watershed or county?
- What actions were taken in a certain time frame, that now need follow-up actions such as monitoring?

The information could be used to produce an annual, statewide report of all habitat conservation activities. The report could include maps showing conservation actions by incentive program, conservation tool, habitat type, and other variables. Information from the database could be used to assist in landowner recognition efforts.

The statewide registry should track the following information: conservation goal(s), habitats and species present and benefiting, number of acres / trees / culverts affected, project coordinator, contact information, project location (including watershed,

county, and ecoregion), funding sources and amounts, match and in-kind contributions, project partners, maps, and past and future phases of the project. In addition, the registry should include opportunities for participants to comment on successes and lessons learned. The registry could protect the privacy of landowners who prefer anonymity by providing an option to display only non-identifying information, and another option to track project locations only at the county or watershed level.

The statewide registry should build on existing efforts to the extent possible. The Oregon Watershed Enhancement Board requires grant recipients to fill out a project reporting form (www.oregon.gov/OWEB/MONITOR/OWRI.shtml) that serves as a prototype. OWEB also maintains data on voluntarily reported restoration projects. This project tracking system is a major step in the right direction, and needs to be expanded to include projects funded by other programs, projects initiated without financial assistance, more details about upland projects, and a website with user-friendly data entry, query, and mapping tools. A national tracking system is being used for many of the U.S. Fish and Wildlife Service's programs, and may be a source of additional information.

8. Develop new incentive programs or expand existing ones to fill identified needs - New types of landowner assistance may be needed to implement some of the Conservation Strategy's actions. For example, there is currently no program that supports landowners who provide ecosystem services. This type of incentive program could assist landowners in maintaining an economically viable operation while providing resources needed for habitat conservation. Growing native plants or seeds commercially for restoration, conserving high-quality intact habitat, or allowing floodwaters to inundate fields are good options.

Two examples illustrate these concepts:

- Peter Kenagy grows vegetables, fruits, and grains on 450 acres of diverse landscape on the Willamette River near Albany. Kenagy also manages a large riparian area, plants hedgerows and crops for wildlife, and controls invasive species. In addition, he is growing native seeds and plants for wetland mitigation, upland prairie restoration, and re-vegetation of public lands. The native crops are well suited to the landscape, contribute to native wildlife and plant habitats, and contribute to the farm's income.
- The City of Albany owns and manages a canal that delivers the municipal water supply from 20 miles away, from the South Santiam River. In the 1996 flood, the canal flooded a residential area in Albany. Subsequently, the City made an arrangement with a farmer just upstream to allow his fields to flood instead of the residential area. In the event of a flood, the City will compensate the landowner for lost income in the flooded field, rather than risk flooding the residential area.

Voluntary Conservation Tools: Conclusions

Changing conditions require adaptable programs. In order to fully implement this Conservation Strategy, Oregon's agencies and conservation partners need to creatively use, adapt, expand, and create voluntary conservation tools and programs. Throughout many of the examples of voluntary conservation programs presented here, there are strong elements of local involvement and flexibility. With the framework provided by the Conservation Strategy there is a tremendous opportunity to strategically target a broad range of tools toward meeting Oregon's conservation goals.

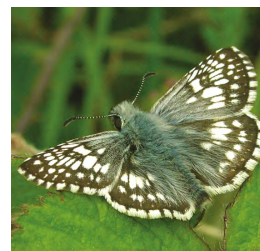


Photo © Bruce Newhouse



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How a Registry of Conservation Actions Can Support Monitoring

What does this registry do?

This database will document progress toward meeting Conservation Strategy goals before broad scale ecological effects are apparent. Coding and mapping different types of conservation tools, such as easements, tax incentive programs, voluntary acquisition, cost share programs, stewardship agreements, and certified agriculture and forestry operations lets state agencies and their partners graphically display the relationship between investments and conservation priorities. Then they can identify geographic or habitat gaps in implementation of the Conservation Strategy and begin to understand which techniques produce the most effective results.

A state-level monitoring program will require accessing information held by different agencies and organizations. A registry of conservation actions can be a helpful first step in organizing and sharing information. Involvement of partners in this step will help ensure cooperation with data collection, information sharing, and program implementation. Ideally, conservation projects will be monitored to demonstrate progress toward Conservation Strategy goals, and some conclusions can be drawn regarding the effects or outcomes at the site level and more broadly across the landscape.

What will be tracked? How will this information help monitoring? Many state fish and wildlife strategies are designed to implement conservation actions, which can be tracked by asking the following simple questions:

Action Question	Example	Monitoring Type	Time Frame
1. Was the conservation action implemented?	Were the trees planted?	Compliance monitoring	Short term
2. Did it work?	Did the trees survive and grow?	Effectiveness monitoring	Medium term
3. Did it have the desired effect on species and habitats?	Do the trees provide better habitat?	Validation monitoring	Long term
4. Was it the action that caused the effect	Did planting the trees provide better habitat or did climate change?	Causality	Long term

In the short term, the first question asks whether state agencies and their partners have made strategic investments in the region’s natural capital at the habitat level. In the medium term, did the conservation actions work? Over the long term have desired species or habitats increased, declined or remained stable? Can this result be linked to Conservation Strategy conservation actions?

Voluntary acquisition, easements, incentives, and certification can be monitored and analyzed for cost effectiveness as well as accomplishments. For example, do forests certified by the Sustainable Forestry Initiative or the Forest Stewardship Council support more abundant and diverse wildlife? Are easements and incentives as effective as acquisition? Answers will help states be more strategic in prioritizing wildlife management tools.

The conservation registry would track the following information:

Goals	Actions	Mappable Indicators	Targets
Conserve and restore habitat through...	Tax incentives Restoration projects Easements Acquisitions Habitat improvement Certification Stewardship agreements Tracking threats	Acres, Transactions, Site-based actions in: a. priority habitat b. other habitat	Acres, Transactions, Site-based action By Date



Photo © Bruce Newhouse

Engaging Oregonians in Conservation: Strategy Outreach, Conservation Education and Fish and Wildlife-Based Tourism

Overview

Connecting people to nature is an important element of successful Conservation Strategy implementation. Acquiring the basic functional knowledge, skills and motives to conserve Oregon's native fish and wildlife allows people to work together to take strategic actions for the benefit of current and future generations. Fostering broad participation in conservation will be critical to truly meet the Conservation Strategy's goals of maintaining Oregon's fish, wildlife and habitats. There are different ways to engage Oregonians in conservation. Elsewhere in this document, the Conservation Strategy describes ways people can get involved in on-the-ground projects and in citizen-based monitoring. This chapter describes additional opportunities:

Strategy Outreach – the need to tell people about the Strategy's goals, voluntary approach, and opportunities, and **Conservation Education** – provide opportunities for people to learn about their natural environment.

Fish and Wildlife-based Tourism – support existing and expand sustainable fish and wildlife-based recreation to increase support for fish and wildlife conservation and support local economies.

"Human Dimensions" Research – learn more about how people want to be involved in conservation and how to best support landowners in voluntary conservation.

These topics are inter-related and overlapping. For example, a "birding trail" - a well-organized and interpreted series of bird watching sites - can allow families to spend time outdoors together, enjoy wildlife watching, learn about bird identification and behavior, learn about conservation issues facing birds, and see habitat restoration projects that benefit birds.

Strategy Outreach and Conservation Education

Education and outreach are two components of a successful conservation strategy. According to the North American Association of Envi-

ronmental Education (www.naaee.org), conservation education should foster clear awareness of conservation issues; provide opportunities to acquire knowledge, interest, commitment, and skill; and can create new patterns of behavior. Many current education programs focus on building awareness, but knowledge and awareness of issues are just the first two steps. Conservation education programs need to serve all age levels, go beyond environmental sensitivity, and include action items to model behavior. Ideally, conservation education will provide Oregonians with an understanding of the various issues involved with species conservation and natural resource management so they can understand all sides of complex issues and support sound decisions.

There are several predictors of high quality conservation education:

- Fairness and accuracy
- Depth of knowledge
- Emphasis on skills building
- Action and orientation
- Instructional soundness
- Usability and applicability
- Life-long learning

In the context of this Conservation Strategy, conservation education and outreach around the state should be tied and targeted at Conservation Opportunity Areas identified within the Conservation Strategy. Education programs can be linked directly to on-the-ground conservation efforts throughout the state, and conversely, those conservation efforts should take every opportunity to incorporate education (e.g. citizen-based monitoring and interactive project-based nature programs). Delivery of education and outreach needs to be community-based and community driven, which implies partnerships between schools, conservation organizations, agencies, businesses, and others. Engaged communities are able to develop innovative and cooperative conservation actions, support strategic conservation investments, and

steward conservation areas effectively. Education partnerships should aim to inspire communities to create a better future for fish and wildlife and their habitats.

All species and habitats are connected. Fish and wildlife occur everywhere and are connected to people. Through fish- and wildlife-based recreation and through land management activities, people are connected to fish and wildlife. These are some of the messages Conservation Strategy implementers can use in outreach efforts. A statewide outreach effort might begin by developing broad messages, identifying discrete target audiences (both potential implementation partners for the Conservation Strategy and broader audiences), and refining the broad messages for each target audience. Outreach messages should be tied to an issue or an opportunity and presented as a positive vision for the future. Conservation Strategy implementers can then say, "Oregon has a strategy, a way to achieve this vision." Oregonians are proud of their culture, history, and people. Outreach could build from these strengths. In the past, present, and future people will take great strides or make sacrifices to further conservation. It is important to celebrate conservation successes and significant conservation attempts. Oregon is increasingly diverse, so conservation-related information needs to be readily available to and understandable for a broad array of audiences.

Implementing the Conservation Strategy will require new and broader coalitions of partners. One of these coalitions should focus on education and outreach, coordinating conservation education at the state level and creating demonstration projects as educational tools for target audiences. There is a need to recruit new conservation partners and engage conservation education providers in strategic conservation efforts.

Conservation education is beginning to embrace effectiveness monitoring to improve its efforts. Traditionally, conservation education has not been evaluated beyond the number of participants in a program. Conservation Strategy implementers and conservation education providers can promote the practice of formal evaluation and tracking of not only conservation education inputs, but outcomes as well. Conservation partners could provide model evaluation tools for conservation education providers.

Education and outreach is one type of conservation action, and will be most effective when linked strategically to other actions such as land management and habitat conservation, water management, or incentives for private landowners. Successful implementation of this Conservation Strategy depends on expanded involvement from a wide variety of people, agencies, and groups across the state. Effective outreach will be needed to share the goals, voluntary approach, recommended actions, and benefits of habitat conservation to diverse Oregonians and

partners. Equally important tasks are listening to input from diverse sources and providing opportunities for meaningful involvement and decision-making. Some important audiences are:

- *All Oregonians:* Help individuals, organizations, and communities understand statewide habitat conservation goals in both urban and rural areas, with a focus on locally occurring ecoregions, habitats, and species. Help people recognize habitats within local landscapes and understand the diversity of species that use these habitats. Provide information on the actions people can take to benefit species and habitats, including conservation programs, tools, and other available support. Build connections between the diverse communities of Oregon to help support a statewide commitment to conservation of Oregon's fish, wildlife, and habitats. In addition, both urban and rural landowners should get recognition for the contributions they are already making to species conservation. Farms, ranches, and forests provide a variety of fish and wildlife habitats, and many rural landowners are actively improving habitat through improved management practices or specific projects. Provide information about these contributions and the connections that all Oregonians have to agricultural and forest landowners who grow the food they eat and the other products they use. Introduce urban Oregonians to diverse products from rural landowners who use certification or marketing programs that support sustainable or habitat-friendly activities. Similarly, recognize positive efforts to address conservation issues and provide habitat within urban areas, such as sustainable building, invasive species control, "Naturescaping" in backyards, and maintaining natural park networks that support fish and wildlife habitat and improve the quality of life for people.
- *Federal and State Agencies and Other Conservation Partners:* Provide information about the Conservation Strategy and opportunities for coordination. Help diverse agencies and staff understand statewide and ecoregional habitat conservation goals and incorporate them into programs, policies, and priorities whenever possible. In addition to agencies, there are potential roles for landowners, land managers, non-profit organizations, universities and schools, business owners, local governments, elected officials, planners, consultants, and civic groups. Outreach efforts need to target all potential conservation partners.
- *Young Oregonians:* The future lies with Oregon's younger Oregonians, in both K-12 and higher education (colleges and universities), who are the decision-makers of the future. Young people, both in rural and urban areas, need to see good exam-

ples of real people integrating ecological and economic values on farms and in forests, and diverse and innovative partnerships for habitat conservation. The more exposure young Oregonians have to real people doing habitat conservation, the more likely they are to support these activities in adulthood. Programs for young people need to include opportunities to participate in habitat conservation projects, whenever possible. Opportunities include working with youth groups, local governments, schools, and service learning programs. This exposes students to different learning opportunities, helps them develop a sense of commitment to their community and local habitats, and may introduce them to possible careers in the field.

There are opportunities to work with educators to provide additional opportunities for teacher training on conservation education curriculum and instructional strategies at no cost to teachers or schools. Classroom-based conservation education programs can be integrated with state academic standards and linked with standards for reading, math and other subjects beyond science.

Research conducted by undergraduate and graduate students can be an important way to address information and monitoring needs for the Conservation Strategy. Colleges and universities are important partners for providing educational, technical expertise, monitoring and research assistance to landowners, Oregonians, agencies, and policy-makers.

Some Ongoing Efforts

The Conservation Strategy will build on existing efforts to conduct outreach and conservation education, expanding existing efforts partnerships. The following provides some examples of the ongoing efforts by many agencies, schools and organizations in Oregon:

- Interpretation presentations and educational program (such as campground talks, nature walks, skills workshops, hunter and angler education programs, games and other children's programs, exhibits)
- Informational signage, brochures, videos and other material (at agency offices, trails, campsites, wildlife refuges and other outdoor recreation sites)
- School-sponsored learning (such as outdoor camps, internships, restoration projects at schools, classwork)
- Special events (such as festivals, Oregon Zoo and Oregon Museum of Science and Industry field camps)
- Fish and wildlife viewing programs (such as whale watching, bird watching, elk viewing)

- "Living with Urban Wildlife" by the Audubon Society of Portland and other programs focused at reducing human/wildlife conflicts in urban areas
- Media relationships
- Booths at county fairs and other community events
- Volunteer programs

Also, citizen-based monitoring [for example, Monitoring Avian Productivity and Survivorship (MAPS) program and the North American breeding bird survey (BBS)] can provide opportunities for Conservation Outreach and environmental education. Citizen-based science will be an important tool for monitoring within the Conservation Strategy and will be focused on monitoring priorities.

Opportunities

There are many opportunities to improve coordination, strategic implementation, and evaluation of conservation education in Oregon. Some recommendations include:

Build on existing efforts

- Inventory conservation/environmental education activities currently under way to determine which could help promote the Conservation Strategy.
- Work with local, state and federal parks, wildlife areas, campsites and other recreational programs to enhance interpretation programs
- Enhance effective partnerships with organizations whose primary mission is conservation education (e.g. non-governmental organizations, universities, agencies). Seek new conservation education partners in Oregon.
- Fold Conservation Strategy priorities into the education and outreach activities of federal, state and local natural resource agencies, nongovernmental organizations, and other education providers.

Formal education

- Restore the Oregon Department of Fish and Wildlife commitment to "Project Wild" (environmental and conservation program for educators of K-12 students).

Marketing and promotion

- Develop education materials about the Conservation Strategy and for its promotion. Produce outreach materials addressing Strategy Species and Habitats, Conservation Opportunity Areas, and conservation actions and issues. Inform people about opportunities to weave conservation goals into ongoing planning,

greenspace acquisition and management, and neighborhood projects, educational programs, restoration programs and so on.

- Work with media partners to promote the Conservation Strategy and its implementation priorities and create messages which report/publicize successes achieved by the Conservation Strategy for nature conservation.
- Produce “virtual tours” on the Oregon Department of Fish and Wildlife web site of particular areas of the state to promote Strategy Habitats and Species and link to websites of other partners.

Incorporate Outreach and Education into Other Voluntary Actions

- Produce informational brochures for landowners on Strategy Species and Habitats (also see the Voluntary Conservation Tools Chapter, pages 70 to 88).
- Develop educational tools that complement on-the-ground conservation actions and management for Strategy Species and Habitats.
- Work with the Oregon Invasive Species Council to develop a statewide invasive species awareness campaign, which will assess Conservation Strategy needs for education and marketing. Develop other tools for public participation for preventing introductions of new invasive species to Oregon.

Fish and Wildlife-Based Tourism

Because of its natural resources (diversity and beauty of its landscape and richness of its flora and fauna), Oregon is an outstanding state for its residents and visitors to enjoy and recreate in. When carefully planned and implemented, fish and wildlife-based tourism can promote fish and wildlife conservation through public outreach and support, diversify local economies, and provide rewarding experiences for a variety of people. Oregon Department of Fish and Wildlife’s approach is to support efforts to create and promote sustainable fish and wildlife-based tourism opportunities within the context of the Conservation Strategy’s larger conservation goals. In this discussion, the term “wildlife tourism” refers to recreational activities based on both fish and wildlife use and appreciation.

Objectives

1. In collaboration with Travel Oregon and other relevant government agencies, provide strategic direction and leadership on sustainable wildlife watching opportunities and education in Oregon.
2. In cooperation with relevant Oregon government agencies, promote sustainable tourism and tourism generated, economic development (including ‘product’ innovations for visitors) appropriate to Oregon’s regional communities and consistent with the values and principles underlying the Conservation Strategy.
3. In association with private industry and government, investigate potential sources of future income generation - resulting from sustainable wildlife tourism development and growth - that will benefit both local communities and the Conservation Strategy’s wider conservation goals.
4. In partnership with Travel Oregon, integrate sustainable tourism opportunities, where appropriate, into regional and state-wide programs developed as a result of the Conservation Strategy.
5. Where relevant, facilitate greater collaboration and cooperation over wildlife tourism opportunities in Oregon with interested regional and state tourism associations, Oregon’s destination management organizations, tourism industry operators and key stakeholders identified through the Conservation Strategy development process.

Joint Challenges and Opportunities

- Enhancing awareness of the workings and interests of the tourism industry and its relevant opportunity areas amongst the stakeholders, regional organizations and fish and wildlife programs, associated with the Conservation Strategy.
- Enhancing awareness of sustainable wildlife-based tourism opportunities and relevant conservation needs, interests and priorities within Oregon’s tourism industry – particularly its nature-based tourism sector.
- Aligning conservation programs and sustainable tourism development needs and opportunities of Oregon and its regions.

Background: Participation in and Value of Fish and Wildlife-based

Tourism - National recreation surveys in the U.S. have provided useful information on popular activities in the U.S. They provide both valuable indicators of Americans’ outdoor recreation interests and potential pointers to their receptivity to offers and opportunities to enjoy such interests when visiting different places or destinations.

Wildlife tourism - growth and value

- Nationally in the USA, wildlife viewing is the third highest purpose for trips each year (671 million) after sightseeing (1037 million) and family gatherings (778 million). It is expected that wildlife activities will increase 61 percent nationally over the next 52 years to Year 2050.

- Wildlife viewing is an activity that can be enjoyed all year round by virtually all ages.
- Nature tourists involved in wildlife appreciation are almost evenly divided between men and women.
- 31 percent of Americans 16 years and older say they observe, feed or photograph wildlife.
- An estimated 94.1 million people made time to view wildlife or wildflowers.
- 69.4 million people watched birds.
- 32 percent of the U.S. adult population view or photograph birds.
- 42.8 percent view or photograph other wildlife.
- 45.2 percent view or photograph wildflowers and natural vegetation.
- 54.8 percent view or photograph natural scenery.
- An estimated 129 million people took the time to stop and observe the natural scenery around them.

Tourism trends

According to the Travel Industry Association of America, significant travel trends affecting Oregon's tourism industry include:

- Oregon's diverse regions – from the coast and mountains, to valleys and deserts – offer a rich variety of outdoor activities for everyone from the extreme sport participants to fishing enthusiasts to the family vacationer.
- Recreation and adventure interests and options range from the 'soft' (at the more relaxed, observational and passive end) to the 'hard' (more active and physical with an element of potential 'danger').
 - Outdoor recreation and/or visiting national or state parks is one of the top activities for U.S. travelers taking leisure trips within the U.S.
 - One in five (21 percent) leisure person-trips includes some

form of outdoor recreation and/or a visit to a national or state park.

- Half of all U.S. adults, or 98 million people, have taken an adventure trip in the past five years. This includes 31 million adults who engaged in hard adventure activities like whitewater rafting, scuba diving and mountain biking.
- Camping is the number one outdoor vacation activity in America. One-third of U.S. adults say they have gone on a camping vacation in the past five years. The average age of travelers who go camping is 37 and their median household income is \$43,000.
- One-fifth of U.S. adults attended a festival while on a trip away from home in the past year. One-third of festival travelers attended an arts or music festival in the past year; Twenty-two percent of festival travelers attended an ethnic, folk or heritage festival.

Participation rates– fishing and viewing wildlife

- During 2001, the Oregon Department of Fish and Wildlife sold 303,635 hunting licenses and tags, and 689,669 fishing licenses and tags. Of those, 282,102 hunting licenses and tags were sold to Oregonians, and 517,666 fishing licenses and tags were sold to Oregonians.
- Licensed resident hunters make up 8.1 percent of the total state population. Licensed resident anglers make up 14.9 percent of the total state population. There is no method to track the percentage of wildlife viewers.

Participation rates by visitors in key nature-related activities:

- Over half of all Americans are adventure travelers, with about forty-five percent of these engaged in soft adventure travel.
- Almost 25 million Americans travel to watch wildlife.

Economic contribution of Fish and Wildlife based activities in 2001

- Results from surveys conducted by the U.S. Fish and Wildlife Service showed that Oregon derived \$2.1 billion in revenue from all wildlife-related recreational activities in 2001. Of that amount, Oregonians spent \$1.7 billion.
- The USFWS found that Oregonians spent \$769.4 million on wildlife viewing in Oregon in 2001.

Spending Categories	Hunters	Anglers	Viewers
Food and Lodging	\$46.2 Million	\$99.9 Million	\$182.2 Million
Transportation	\$42.3 Million	\$84.8 Million	\$108.5 Million
Other Trip Costs *	\$20.2 Million	\$74.2 Million	\$14.4 Million
Equipment	\$232.5 Million	\$245.5 Million	\$340.3 Million
Other * *	\$23.7 Million	\$97.4 Million	\$124.0 Million

*'Other trip costs' include expenditures for guide fees, land-use fees, access permits and equipment rental.

** 'Other' expenses include expenditures for magazines, membership dues, contributions, stamps and permits.

Opportunities

All tourism opportunities promoted by the Conservation Strategy will be implemented in partnership with Travel Oregon. ODFW will work with willing landowners/managers, communities and other partners in developing projects and be sensitive to any concerns local communities may have. All proposed actions must review and consider any potential impacts to both species and habitats.

1. Planning, policy and project development - joint tourism marketing and market research opportunities: Under Brand Oregon, explore joint opportunities for cooperative marketing of key nature-based tourism themes (including wildlife watching). In addition, determine priority areas of joint need for undertaking cooperatively funded market research that will better inform the marketing and product development strategies adopted.
2. Determining regional priorities for tourism attention in relation to wildlife watching opportunities and their marketing and development: In relation to any regional program development criteria involving wildlife tourism initiatives, investigate the merits of applying two or more levels of developmental and marketing status for Oregon's eco/tourism regions.

Each level would be acknowledged to have different strategic and program support needs, which also might logically reflect different levels of investment. For example:

- ready proximity to visitor markets (and major ports/cities/highways of entry);
- product/experience readiness;
- product quality;
- extent of products' visitor and market appeal
- extent of supporting amenities and services (including nearby accommodation options);
- the extent of other available experiences' of complementary importance to visitors

Some regions might be designated as 'emerging', and others as 'advanced' when evaluating comparative development and marketing opportunities.

3. Building on existing and recent wildlife-watching programs: Many fish and wildlife-watching programs exist and can be supported and expanded.
 - Work with Travel Oregon, Oregon Parks and Recreation Department, Audubon Society, and other partners to promote development of "birding trails" in Oregon, building on the current network of trails.

- Work with Oregon Parks and Recreation Department to support existing whale watching programs and work with local groups to promote existing wildlife festivals.
- Restore and enhance Oregon Department of Fish and Wildlife's leadership in the "Watchable Wildlife" program in Oregon to promote opportunities to provide fish and wildlife viewing; market Oregon as an outstanding fish and wildlife-viewing destination; provide interpretation for priority sites; enhance respect for Oregon fish and wildlife; and recreate strong partnerships with diverse constituents.

4. Determining a cost effective education and development approach to wildlife tourism in Oregon: Great benefits can result from adopting a tourism education and tourism development approach that draws on the success of others and the value of trialing new 'product' ideas through pilot projects selected for their high likelihood of success and their likely educational value. For example, in relation to privately owned and operated wildlife and nature-based tourism services/attractions, the successful case studies represented by Wanderlust Tours in Bend, and Marine Discoveries in Newport could be documented and distributed (possibly in association with Travel Oregon). Research the basis of success for such leading nature-based products and other international example of best practice in this interest area.

5. Developing further highly innovative wildlife experiences (including outstanding interpretive facilities) that capture the imaginations of visitors as well as national and international recognition and publicity: Today visitors can choose from a world of competing leisure and entertainment options – with the form of these often crossing over from one traditional context to another (e.g. cruising, entertainment, food, on board rock climbing walls, etc). Visitors are far more discerning and aware of an explosive growth in these available options. Therefore in the context of beautiful natural environments and wildlife viewing opportunities, it is no longer simply the beauty and the animals alone that can constitute the extent of the experience, but the way in which the experience itself is provided and accessed. An example is the tree top canopy walks that have been designed around the world – some seemingly offering an intrinsic (but safe) sense of danger as part of their appeal. Another good example is the BLM Cascades Streamwatch (Wildwood Recreation Area) facility near Mt Hood – where the viewer can look into the side of the stream at young salmon in which they

are living. Exploring exciting new 'world standard' opportunities here for a range of suitable wildlife experiences (jointly with other agencies or private investors) is a serious investment option for regions and locations that possess the right mix of wider tourism destination, product and marketing qualities. The development of trails such as the Birding Trails of Oregon, warrants an exploration of the opportunities for innovation, but equally importantly very thorough implementation of the trail's on the ground (real life) features – signage, interpretation, supporting guide books, their distribution, their cross promotion of companion needs like accommodation and food, equipment supplies, etc.)

Potential focus areas for innovation could also include – innovative/best practice visitor interpretation developments, exciting new wildlife observation facilities and tours, or even new joint ventures with private industry over nature-based accommodation options adjacent to high interest natural environments.

6. Enhancing the impact of tourism-based marketing investments: The Oregon Department of Fish and Wildlife website is comprehensive in relation to information on hunting fishing and other wildlife opportunities etc. However the tourism/visitor appeal component to these is largely implicit, not explicit. The explicit visitor appeal and service components ("how to's") to the Oregon options with wildlife should be more 'up front', and organized in a way to directly meet visitor needs as well as linking to related sites offering tourism assistance. For example, the Oregon Department of Fish and Wildlife home page should have a direct message and 'click on window' for interested visitors to Oregon. The website could provide website links to other entities with natural resource tourism interests. Special maps that are designed to visually and readily address the tourism and travel needs of visitors could be developed and able to be printed. (Many existing road maps are focused purely on directional and place information, they are not tourist maps deliberately highlighting instantly helpful things of high likely interest to tourists.)
7. Adopting a proactive leadership role on sustainable wildlife tourism practices and opportunities in Oregon and exploring further related partnership and alliance opportunities: Investigate joint project possibilities of mutual interest. Identifying overlapping areas of visitor/community related policy, planning and development activity and exchanging research and policy insights - as well as knowledge of new development oppor-

tunities - normally proves highly productive for all parties to partner-based initiatives. Agencies' day-to-day policy decisions (e.g. timing of hunting and fishing seasons) can prove of great importance and benefit to tourism in Oregon. Regular liaison with Travel Oregon and Oregon's tourism industry (including regional Destination Management Organizations) could be helpful in addressing potentially unforeseen impacts to tourism.

Over time, partnership development with the tourism industry could generate sufficient revenues to some wildlife/nature based industry tour operators (e.g. whale/marine watching) to permit them to contribute to conservation and scientific activities surrounding those experiences. One example - hiring marine scientists by the licensed and lucrative Quicksilver boat tours to the Great Barrier Reef in Australia. These scientists assist in furthering important studies of the reef and its eco-system and protection. Visitors can, in some circumstances, pay to have the special experience of contributing to scientific research efforts, on special sites that only they can access.

Further tourism and economic development options might include an exploration of how to advance partnerships with local and regional festivals with a nature or wildlife based theme – to help these become stronger in appeal and more successful for their communities and for the programs that support them.

Building closer working relationships with the convention/conference and meetings tourism sector to expand the available conference leisure options for business and other visitors is a further possibility. Partnering with tourism operators to build greater visitor and community awareness of conservation issues, practices and participation opportunities is another.

Partnering efforts with regions and communities can help allay their possible fears of the negative effects of tourism – fear of invasion or loss of quality of life. The TIA and National Geographic Traveler have identified a highly significant new values-based tourism market, "Geotourism" that treads lightly and values community concerns here. The key need is to manage the types of tourism sought – and focus on target markets that will benefit people and places, not harm them.

8. Planning for sustainable wildlife related tourism and growth: Affirm the known tourism industry and community desires in Oregon for a sustainable approach to tourism development in the State's regions and a planned approach to tourism growth.

In pursuing such a goal, consider the merits of adapting or utilizing an existing model of best practice (such as that developed for conservation based industry accreditation by Ecotourism Australia, who has also been providing similar policy development services to the World Tourism Organization.)

In accordance with industry feedback, consider developing an 'Oregon model' for wildlife tourism planning, along with a widely available charter identifying its key development values and principles. Sustainable tourism policy positions have been actively adopted by many leading destinations and states around the western world and beyond (e.g. Costa Rica). Their governments and industry leaders share the view, apparently strongly shared by the Oregon tourism industry that it is essential to protect significant community and tourism assets if the industry is to continue to prosper well into the future. Such policies also serve to maintain visitor satisfaction and community goodwill. Oregon's tourism industry leaders share the view that staying true to Oregon's natural and civic heritage and character will provide the best tourism opportunities.

Such a best practice model would be instrumental in helping retain Oregon's sense of distinctiveness (Keeping Oregon 'Oregon') and the essential qualities and way of life that makes the state and its regions so appealing to local communities and visitors alike. It would draw on and reflect these authentic qualities and Oregonians' most prized community values – including

their pride in the state's comparatively unspoiled natural beauty and protected wildlife.

"Human Dimensions" Research

Social research can support conservation by increasing understanding of what connects people to nature, how people view conservation, what conservation actions appeal to them and how to build public interest in stewardship. Cultural background influences all of these viewpoints, as well as how to best communicate with people. As Oregon becomes increasingly diverse, conservation outreach needs to consider a variety of cultural values.

Environmental education and fish- and wildlife-based tourism programs should be monitored to determine if they appeal to people, if they are meeting their goals, and how they can be improved. Lastly, it is important to better understand what landowners need and want to support voluntary conservation on their land. Conservation partners need to work with landowners in determining, design and evaluate conservation actions; in other words, how to make conservation work better on-the-ground.

"Human Dimensions in Wildlife" is an emerging field of study that blends sociology and ecology to answer these kinds of questions. The social sciences provide a variety of research methods including surveys and questionnaires, focal group discussions, and workshops. Partnerships with universities that do public policy and other social research can address some of these information needs.





Monitoring For Success

This Conservation Strategy identifies ways to make monitoring efforts more comprehensive, integrated, efficient, and frugal by focusing monitoring on the status of species and habitats, and the effectiveness of conservation actions.

This section:

1. Provides an overview of monitoring (“Monitoring in Oregon: some frequently asked questions”
2. Lists recommendations for monitoring in support of the Conservation Strategy (“Specific Recommendations and First Steps for Monitoring in support the Conservation Strategy”)
3. Presents current ongoing efforts to monitor species and habitats in Oregon (“Current ongoing efforts to monitor species and habitats in Oregon: How the Conservation Strategy builds on existing efforts”)

Monitoring in Oregon: Some “Frequently Asked Questions”

Why is monitoring so important?

Investments in conservation should be strategic, effective, and account-

able. Success of these investments can be measured by: 1) assessing existing conditions (2) identifying desired conditions and 3) measuring change over time.

A well-designed monitoring program takes an adaptive management approach (see sidebar) using verifiable and reliable science. Monitoring objectives should be simple, easily communicated, and relevant to people’s concerns. Data and information derived from monitoring should be easily understood, well-documented, and accessible in a variety of formats for relevant audiences (e.g., scientists, public and private land managers, and policy makers). Results should be displayed graphically and spatially and made relevant to Oregonians. Monitoring in support of the Conservation Strategy will involve work with partners to reach conventional and new audiences, and engage interested lay Oregonians. Bird population and water quality monitoring programs are excellent models.

At what scale should monitoring occur?

Monitoring may occur at different scales--site, stream, watershed, ecoregion, and statewide. While different questions may be addressed at each scale and different variables measured, all should be unified and

How should monitoring begin?

Monitoring can be initiated to achieve a variety of goals. Goals will determine what should be monitored, how it should be monitored, and for how long. Monitoring may be directed toward individual species or species groups, habitat conditions, ecologic function, or ecological integrity. This table lists example questions and possible measures for a monitoring project focusing on grassland songbirds. This example demonstrates effectiveness monitoring.

Type of monitoring	Question	Measure
Project-level	Was the project implemented as planned?	Number of acres planted with grasses and wildflowers
Project-level	Was the project successful as planned?	Survival and establishment of planted grasses and wildflowers.
Resource (songbird “health”)	Did the project benefit grassland songbirds in the short-term?	Number of grassland songbird pairs before and after project implementation, reproductive success of pairs
Resource (songbird population trends)	Did the project benefit grassland songbirds in the long-term?	Population trends of grassland songbirds

focus data collection on a defined purpose. Useful monitoring should be directed at the same scale that the conservation action or limiting factor is occurring. Monitoring conducted in Oregon can be incorporated into regional, national, and international efforts to examine larger-scale population or ecologic trends.

Criteria or benchmarks of desired habitat conditions should be identified to evaluate habitat changes. Habitats in good ecological condition provide references for identifying degraded habitats needing restoration. However, reference conditions can be difficult to define and use. Reference conditions should be described at a regional scale, and with an understanding of natural ecological variability. This provides for comparison within similar ecological conditions. Using a combination of expert opinion, historical data, modeling and regional surveys should be used to define reference conditions. Consider disturbance history such as logging, land clearance, channeling, sediment loading, or groundwater contamination. Finally, methods need to be developed to quantify levels of “background” disturbance and its variability. Monitoring should be responsive to the changes that occur over time (e.g., seral stages).

To ensure that monitoring occurs at appropriate scales, the Conservation Strategy's approach to monitoring is intended to:

- Determine areas to be monitored and specify the level of detail. Monitor habitat at the statewide scale, including distribution of conservation actions and habitats. Track at finer scales for rare

or rapidly changing habitats of concern.

- Review progress toward monitoring objectives annually or biannually to determine if conservation actions are achieving goals and if state conservation goals should be refined.

How does applied research relate to monitoring?

The Conservation Strategy takes a broad approach to monitoring and includes applied research. Applied research seeks knowledge necessary to improve management of species and habitat. In addition, it includes evaluation of monitoring programs and approaches, such as the utility of indicator species.

Monitoring designs should be quantitative, scientifically sound and clear in purpose asking: What information is needed and why? Design and methods must be goal driven and address the appropriate scale across space and time. The degree and extent of a monitoring design must be budgeted appropriately. The data should be useful to a variety of audiences (e.g., scientists, policy makers, Oregonians). Use the Framework for Monitoring Programs described below when developing or modifying programs.

Framework for Monitoring Programs

(Based on USGS General Concepts for a Monitoring Program; www.teaming.com)

1. Identify monitoring goals; determine questions to be answered accordingly.

What is Adaptive Management?

Because natural systems and conservation issues are inherently complex, natural resource managers must continuously learn from their experiences as they restore habitats or implement other conservation actions. They must then adapt their approaches to respond to new information or to changing conditions. This process is called “adaptive management.” In adaptive management, resource managers assess results of actions and modify their future actions, viewing each action as an experiment. However, adaptive management is not just trial-and-error. It is a thoughtful and rational process in which assumptions are tested so resource managers can determine not only what actions work, but why. An example framework:

1. **Assess.** Assess existing condition. Develop concepts about what factors are creating the current conditions.
2. **Plan.** Determine desired conditions. Determine what actions could be implemented to address factors contributing to current conditions.

3. **Implement.** Take planned action.

4. **Monitor.** Detect change over time and compare to desired conditions.

5. **Learn.** Analyze and evaluate monitoring results. Refine concepts about what factors are creating the current conditions and how conservation actions should be modified (if at all).

6. **Adapt.** Modify conservation actions accordingly.

7. **Iterate.** Repeat process over time.

Ideally, the lessons learned through adaptive management are shared extensively so conservation actions can become more effective and cost-efficient over larger areas. By sharing results researchers and resource managers can view results in a broader context of space and time.

2. Identify parameters to monitor (e.g., - species population trend, shrub density, stream temperature).
3. Determine appropriate monitoring protocol(s) and analytical tools.
4. Provide mechanisms for quality control (e.g., data standards, training observers).
5. Ensure data are maintained, proofread, archived and remain accessible.
6. Conduct appropriate data analysis.
7. Report results and recommendations in a timely manner.
8. Review monitoring goals and methods to ensure that they are still relevant and appropriate.

What should be monitored?

It is neither possible nor desirable to monitor everything: natural resource professionals must make reasoned decisions about what to monitor and a number of trade-offs. For example, a project leader needs to decide how much to put into a project versus into measuring the success of that project. Priority is often placed on species or habitats in decline. The Fish and Wildlife Monitoring Team will determine criteria for selecting species and habitats to monitor in support of the Conservation Strategy.

Why and how should Oregonians have opportunities to monitor?

Citizen-based monitoring can greatly expand scientists' ability to collect data. Oregonians can often contribute valuable local biological knowledge. For example, bird-watchers and anglers understand the distribution and behavior of their favorite species. Farmers and other landowners have deep familiarity with what occurs on their land. Citizen-based monitoring can tap into this knowledge, increase the amount of data that can be collected, and reduce the costs of data collection. Citizen-based monitoring also engages Oregonians in conservation, teaches people about their local environment, and provides feedback on conservation actions they may be taking on their land or in their neighborhood.

Citizen-based monitoring programs need to be well-designed to make the best use of people's valuable volunteer time. Challenges include inconsistent methods, variable data quality due to observer bias, high turnover of volunteers, lack of scientific training for volunteers, and data management issues. These can be addressed through simplified monitoring designs, training programs, monitoring field guides, and large sample sizes. Because citizen-based monitoring programs usually aren't statistically rigorous, they can't be used for research or manage-

ment decisions. However, they are extremely valuable for tracking trends, such as changes in water quality or bird populations.

In Oregon, some examples include water quality, Christmas Bird Count, North American Breeding Bird Survey, Fourth of July Butterfly Count, Valentine's Day Herp Count, and dragonfly migration monitoring. Volunteers also often assist biologists in collecting data, a crucial step in monitoring. Such cooperative efforts include the Oregon Bat Grid, Bonney Butte Hawk Migration Count, and deer population trend surveys. By supporting and building on these efforts, scientists and Oregonians can work together to address monitoring priorities identified in the Conservation Strategy.

What help is available to start monitoring?

The Oregon Plan's technical assistance manuals produced by the Oregon Watershed Enhancement Board and manuals developed by the Oregon Department of Environmental Quality to guide water quality monitoring are good sources for launching monitoring programs. During implementation of this Conservation Strategy, ODFW (the Fish and Wildlife Monitoring Team) will develop tools for citizen-based monitoring of selected terrestrial wildlife and environmental conditions such as water quality.

What is the role and importance of monitoring in grants and other funding?

Specific measures for monitoring and reporting results allows grant administrators and other funders to track the progress and investment value of projects they have funded.

Monitoring of conservation or management actions should be funded along with project implementation. Further, natural resource professionals should seek collaborative ways to make monitoring affordable and relevant. Finally, project managers should share results with peers, policy makers and local decision-makers to the extent possible. This allows people to learn what works and adapt actions and policies more efficiently.

What are some other considerations for monitoring Oregon's natural resources?

Ownership and jurisdictional boundaries add complexity to monitoring. Habitat boundaries often do not coincide with ownership or jurisdictional boundaries. Federal, state, local and private owners have different management goals, and conservation goals within each of these ownerships can vary widely. Land ownership changes over time. Habitat monitoring and monitoring programs vary widely in approach, proprietary information, and data compatibility.

To address this situation, adjacent landowners within states and ecoregions need to be familiar with one another and build trust through periodic interaction. Collaborative initiatives, such as multi-stakeholder monitoring groups are fundamental to developing a fish and wildlife monitoring program that has credibility within and beyond the stakeholder group (McKinney et al., 2004)

Peoples' concerns are important in developing a monitoring program. Socioeconomic data are important for successful community-based conservation programs. Partner in determining suitable socioeconomic indicators and implement monitoring programs to evaluate:

- Effects of Conservation Strategy actions (costs, benefits, and implications) on local economies and communities.
- Capacity of communities to take conservation action (is there a watershed council or ongoing efforts?), availability of technical support and incentive programs, and financial resources.

To incorporate peoples' concerns into monitoring, begin by working with stakeholders and managers to understand the effects of past land-use practices. Identify ways to incorporate social change into natural resource planning. Consider what ecological attributes are important to people. Work with other groups (i.e., Economic Development; Oregon Progress Board) on social and economic elements. Effectiveness monitoring should be designed to respond to changes in conservation and/or societal values over time.

Monitoring efforts are often not well coordinated among organizations. Through recent large-scale planning efforts such as the Northwest Forest Plan and Interior Columbia Basin Ecosystem Management Project, monitoring protocols have been developed for many species. However, a variety of agencies, organizations, and individuals still monitor using highly variable protocols and designs. There is no institutional infrastructure to coordinate data collection, management, storage and sharing. Data collected at different sites within a single program may be incompatible. Larger scale analyses, such as statewide trends are hampered by poor data sharing and data incompatibility. Confounding the problem, different groups can define habitat in different ways for different parts of the state (e.g., by vegetation type, or by structural class).

A primary goal of the Conservation Strategy is to improve on coordination of monitoring efforts in Oregon. Standardized methods and formats for collecting key monitoring data need to be adopted and used, making use of new technologies to efficiently collect and manage data (e.g., Sagebrush Bird Conservation Network Study Areas Database). The Fish and Wildlife Monitoring Team will assist with developing and/or adopting standard terminology and methods in monitoring. Local and

ecoregional efforts should be linked to support statewide and nationwide assessments, and providing for long-term data management.

Specific Recommendations and First Steps for Monitoring in Support of the Conservation Strategy

Fish and Wildlife Monitoring Team

Monitoring needs for the Conservation Strategy are larger and more complex than any one agency or organization can sustain. Many ongoing monitoring efforts by groups and agencies already address some Strategy Species and Habitats. However, they are not always coordinated with other similar efforts. In order to make best use of these existing monitoring plans and efforts, Oregon Department of Fish and Wildlife will establish a multi-partner Fish and Wildlife Monitoring Team provide guidance for needed monitoring and assessments.

The Monitoring Team approach will build on the ongoing work to increase coordination between groups and to focus any new monitoring activity on gaps in current efforts. For example, the Team will coordinate with Oregon Watershed Enhancement Board's Oregon Plan monitoring efforts, which focus on aquatic and riparian habitat. This provides an opportunity to incorporate and build on environmental indicators identified in support of the Oregon Plan (http://linr.oregonstate.edu/download/opsw_envindicators.pdf). The Fish and Wildlife Monitoring Team will also coordinate with the Oregon Board of Forestry's efforts to identify indicators that could provide information about the status of native plants and animals on forest lands.

The Monitoring Team would share their recommendations and protocols to agencies, organizations, academia and others looking for opportunities to incorporate Strategy Species and Habitat monitoring into their existing efforts.

The Team should include representatives from federal, state, and local agencies; fish and wildlife user groups; tribes; conservation organizations; and forestry, agriculture, industry, and transportation interests. Their expertise and perspectives on monitoring would provide the groundwork for establishing and maintaining a database and data management system that can be used by a variety of data collectors and managers.

Potential tasks of the Team include:

- Developing a list of potential indicators (including species) and specific criteria to link indicators to Strategy Species and Habitats and evaluate these indicators for suitability, practicality and cost-effectiveness.
- Identifying monitoring priorities, including a list of Strategy Species and indicators to monitor.

- Compiling existing monitoring protocols, developing new monitoring protocols for those species or species groups lacking existing protocols and providing these protocols to potential users.
- Developing or reviewing protocols and other guidance for citizen scientists on how to monitor.
- Synthesizing information from Conservation Strategy monitoring efforts to determine the status of Strategy Species and Habitats. Providing this information to natural resource specialists, land managers, decision makers and other interested parties (e.g., information users or clients).
- Identifying ways to streamline and enhance data management and usability, and developing standards for data collection and management.

Portals of information on the web

Develop and maintain user-friendly web portals similar to the Willamette Explorer (<http://willametteexplorer.info/>) and North Coast explorer (<http://northcoastexplorer.info/>) that provide information on current applied research findings, data on species and habitats presented in a variety of formats geared to different audiences (decision-makers, Oregonians, natural resource professionals). Design portals to allow for data sharing between conservation partners.

Citizen-based monitoring is central to Conservation Strategy monitoring

Oregon Department of Fish and Wildlife will explore options to identify those parts of its monitoring program suitable for citizen participation; collaborate with citizen and conservation groups to promote and implement citizen-based monitoring; and work with partners such as

universities, non profits and landowners to provide training and access to selected databases for citizen contributions.

Charting conservation actions

The registry of conservation actions discussed previously (under How to Get the Job Done: Voluntary Conservation Tools, page 87) will be an important tool for monitoring what kinds of projects are implemented, where they are occurring, what habitats or species are potentially benefiting, and if conservation goals are being met.

Strengthen data management capacities

A critical component of any monitoring program is effective data management. Quality data are needed to evaluate the effects of conservation actions on species and habitats and make appropriate adjustments, if necessary. Some important first steps for data management include:

- Identifying critical data collection activities and associated data management efforts and determining effective methods for providing permanent, consistent data management infrastructure. For example, survey Oregon Department of Fish and Wildlife Monitoring Team, staff, and partners to (1) identify key datasets necessary for implementing conservation actions and determining success through monitoring, (2) inventory current data collection activities relevant to the Conservation Strategy, (3) identify any gaps in current efforts.
- Adopting and using standards for database design, metadata development, and acquisition protocols (e.g., ongoing efforts in Oregon Department of Fish and Wildlife's Natural Resource Information Management Program; OSU's Institute for Natural Resources; Federal, Oregon Geographic Information Council, and NatureServe standards).

Example of a conservation strategy from another state (Missouri)

Like all states, Missouri has prepared a comprehensive wildlife conservation strategy and offers one model for monitoring. Missouri Department of Conservation's approach to effectiveness monitoring will link targets (species, natural communities, restored habitats, and abiotic factors) to proposed conservation actions. Missouri will focus conservation actions and monitoring in priority landscapes called Conservation Opportunity Areas (COA's). COA Advocacy Groups (local partners and stakeholders) will define desired future conditions and needed actions. An Expert Review Panel will evaluate wildlife lists for the primary habitat types and develop a list of "monitorable" targets. This recommendation will be forwarded to the COA Advocacy Group members, and they will decide what to monitor. Effectiveness monitoring will build on the present monitoring activities by all conservation partners active in the COA, not just the Missouri Department of Conservation.

Missouri believes that the best approach to evaluating the health of landscapes and natural communities is to monitor priority environmental parameters or multi-taxa groups of animals and plants, rather than monitoring individual priority species. Good choices for monitoring targets are species that are representative of the habitats, communities that characterize the target landscape, and abiotic factors like water quality measures that provide clues to environmental health. The best choices for monitoring targets are species and communities (or related elements of the community) that respond to habitat change, are detectable and to the degree possible, demonstrate public interest and support.

Track and report results

Monitoring the effectiveness of conservation actions and adapting these actions to respond appropriately to new information or changing conditions requires that results be tracked and reported. The following steps can be taken in partnership with the Fish and Wildlife Monitoring Team, Oregon Department of Fish and Wildlife's Natural Resource Information Management Program, Oregon Natural Heritage Information Center, Oregon Watershed Enhancement Board, and other partners.

- Identify how progress will be measured (that is, specific metrics to be used such as number of acres restored, number of stream miles improved, or number of landowners given technical assistance).
- Implement consistent procedures for data entry so that progress reporting can be done through queries to a database. Where possible, develop tools to automate the reporting process.
- Design web-based data tools to ensure consistent data entry by multiple partners, maintain data integrity, and improve data sharing. The web-based portals are one way this could be achieved.

Current Ongoing Efforts to Monitor Species and Habitats in Oregon: How to Build on Existing Efforts

Overview

The Conservation Strategy recognizes that there are several major ongoing efforts to monitoring the condition of natural resources in Oregon, and intends to build on these ongoing efforts. The Fish and Wildlife Monitoring Team will develop criteria to link ongoing efforts and indicators to monitoring Strategy Species and Habitats. Some key considerations when designing programs to monitor the status of Strategy Species and Strategy Habitats include:

- Monitoring efforts for Strategy Species should emphasize, as needed, either inventory or limiting factors at appropriate spatial scales. Depending on the existing knowledge base, for some species monitoring should focus on basic knowledge of distribution; for other species it should focus on their response to a particular type of management or human activity; or, for other species it should be highly specific (i.e., the degree of contaminants in fish the Lower Columbia River).
- In long-term, ongoing monitoring efforts, emphasize Strategy Species or Habitats and/or support regional or continental programs. Incorporate Strategy Species monitoring into other monitoring efforts. When necessary, monitor priority species one at a time to collect baseline data as needed. Use and build on existing data sets and monitoring efforts to determine status, distribution and trends.

- Use indicators or surrogates where valid.
- Where possible, monitoring should be integrated across taxa, habitats, ecoregions, and management objectives.
- Create incentives for monitoring changes in species and habitat distribution over time, in addition to the short term monitoring that guides management.

Major Plans and Initiatives that Identify Priorities for Monitoring

Oregon's Natural Resources

The Conservation Strategy supports and complements monitoring priorities provided by other existing, ongoing efforts within Oregon.

Oregon Department of Fish and Wildlife reviewed the following plans for priorities and ongoing efforts, There are additional ongoing efforts not reflected here, especially at the local level.

Ecologic Function and Habitats

- Oregon Benchmarks
- State of the Environment Report
- Oregon Plan for Salmon and Watersheds habitat and species monitoring
 - OWEB Monitoring Strategy for the Oregon Plan for Salmon and Watersheds
 - ODEQ Watershed Health Initiative and Volunteer Monitoring Program
 - ODFW Oregon Plan Monitoring Program
 - ODF Forest Practices Monitoring Program
- Northwest Forest Plan and related BLM and USFS local plan updates
- Pacific Northwest Aquatic Monitoring Partnership (PNAMP)
- ODEQ Total Maximum Daily Load (TMDL) planning and process
- ODA SB 1010 plans
- Subbasin plans
- City planning (i.e., City of Portland, City of Bend, etc)

Species and Species Groups

- Regional Seabird Conservation Plan (California Current System only)
- Northern Pacific Coast Regional Shorebird Management Plan
- Intermountain West Regional Shorebird Plan
- Oregon-Washington Partners in Flight Conservation Plans (5 ecoregional plans)
- Intermountain West Region Waterbird Conservation Plan
- Regional Waterbird Plan for the Northern Pacific Coast
- Pacific Flyway Management Plans
- Oregon-Washington PIF Special Species Monitoring and Assessment in Oregon and Washington

- Pacific Northwest Aquatic Monitoring Partnership (PNAMP)
- U.S. Geological Survey Amphibian Research and Monitoring Initiative (ARMI)
- Oregon Bat Grid reports (led by U.S. Forest Service; partners include Oregon Bat Working Group and Western Bat Working Group)
- Ongoing (SageMAP)

Additional concepts were derived from an all-bird monitoring workshop held by Oregon Department of Fish and Wildlife in November 2004. During the workshop, participants identified current monitoring efforts and made recommendations for priorities. Some of these recommendations are included in the following tables. Further recommendations will be incorporated throughout the Conservation Strategy in the Implementation chapter and Ecoregional chapters, as appropriate.

Natural resource monitoring can take one of several different approaches:

What is monitored?	Why?	How is it done?	What are ways to work with current efforts?
Strategy Species	Determine presence, distribution or population status of species; demographic information	Direct surveys of populations or species of interest. Alternatively, link to indicator species	Work with ongoing species monitoring efforts (detailed below)
Indicator species	Strategy Species often are not appropriate as indicator species because they are generally not relatively common and often require specialized habitat.	To be a good indicator, a species needs to be relatively common, occur frequently enough to be monitored and respond to certain actions or represent a desired condition.	The Fish and Wildlife Monitoring Team will work with ongoing programs and evaluate the successes and failures of similar efforts in the past to: develop criteria identify, evaluate, and link indicator species to Strategy Species and Habitats.
Strategy Habitats	Assess habitat conditions over time. Ask: How much habitat is there? Where is it? What is its ecological condition? What is its conservation status?	Direct land use/land cover measurements. Or, link to indicator species	Work with state agency partners. Oregon State University's Institute for Natural Resources will track long term habitat status and trends at a statewide level. Oregon Progress Board recently adopted benchmark to measure the amount and distribution of natural habitats in Oregon's ecoregions.
Aquatic and Watershed Monitoring	Helps ensure good water quality and healthy watersheds; essential for many species and ecological functions	Monitoring the status of aquatic habitats presents unique challenges (i.e., difficult to map). In the Conservation Strategy, aquatic habitat will be expressed in area for some wetland habitat, and stream reach or stream miles for others.	Work with agency partners and ongoing efforts (see Table). Example metric: Indices of biotic integrity (IBIs) combine information from many structural, compositional, and functional parameters and facilitate quantitative comparison of different settings.
Ecological Function	Taken together, habitats and species provide valuable ecological functions. Monitoring ecological function can provide a more efficient and direct measure of impacts than monitoring individual species or habitats.	Measures of hydrology (e.g., channel morphology; flood-plain presence and connectivity; wetland function); physical indicators (e.g., riparian condition; stream connectivity); and water quality (e.g., dissolved oxygen or nutrient levels).	Work with agency partners and ongoing efforts (see Table below).
Limiting Factors	Measuring limiting factors, or statewide conservation issues, at the ecoregional level provides context for conservation priorities both within and across ecoregions.	Measures of hydrology (e.g., channel morphology; flood-plain presence and connectivity; wetland function); physical indicators (e.g., riparian condition; stream connectivity); and water quality (e.g., dissolved oxygen or nutrient levels). Quantify, categorize and graph limiting factors so that they can be presented visually and compared among ecoregions	Link to Oregon benchmarks and other ongoing programs

(continued on next page)

What is monitored?	Why?	How is it done?	What are ways to work with current efforts?
Indicators	Represent valued ecological attributes and can help determine if an impact exists	National Research Council (2000) identified several example indicators: extent and status of ecosystems; ecosystem function and performance	Work with agency partners and ongoing efforts. For example, the Oregon Department of Forestry is engaged in a process to identify indicators that could be used to provide information on the status of native plants and animals on forest lands.
Effectiveness Monitoring	Evaluate the outcomes of conservation actions, or the effects of limiting factors, or to assess progress or status relative to some desired condition. Integral to Adaptive Management.	Measure resource condition before and after change (e.g., management action; conservation action)	Develop registry of conservation actions. Work with ongoing efforts (see Table below). For example: several programs use birds to monitor effectiveness. The USFWS PECE process is another example of an effort to ensure effectiveness of conservation actions.

Current Major Efforts, Gaps, and Priorities

In addressing monitoring, the goal of the Conservation Strategy is to identify key gaps and priorities after considering ongoing efforts. Recognizing that species, habitats and ecological function are interrelated, both Effectiveness and Status Monitoring for Strategy Species and Habitats and ecological function are considered.

Efforts, gaps and priorities occur at various scales and levels of details. For example, many broad topics such as short-and long-term monitoring, single and multiple-species monitoring, the seasonality of monitoring, and monitoring objectives (inventory, abundance, density, demographics, trend, response to management, etc.) will have their own set of efforts, gaps, and priorities. For the Conservation Strategy, broad, multi-site or multi-partner efforts, major gaps, and highest priorities for the next 5-10 years are emphasized.

Strategy Habitats, Limiting Factors, and Ecologic Function

(a) Effectiveness monitoring:

Example Efforts	Gaps and Issues	Priorities
<ul style="list-style-type: none"> ■ Oregon Plan and OWEB monitoring team: review of riparian restoration projects ■ Pacific Northwest Aquatic Monitoring Partnership (PNAMP) ■ Oregon Biodiversity Project ■ Oak restoration monitoring and information sharing ■ NW Forest Plan monitors late successional conifer habitats and associated species ■ Water quality: <ul style="list-style-type: none"> ○ IBI (fish, invertebrates) ○ National Water Quality Assessment Program (Willamette and Sandy River basins; urbanization, agriculture, mercury impacts; nationwide rollout)- Section 401 certification monitoring- NPDES permitting for discharges 	<ul style="list-style-type: none"> ■ Effectiveness of conservation actions recommended for most Strategy Habitats. ■ Most Strategy Habitats are currently not being monitored. ■ Use of historical data on habitats can be hindered by differences in remote sensing methodology used ■ Need way to changes in habitat quality over time (e.g., percent native plants, structure), not just aerial extent of habitat. ■ Oregon Plan identified gaps: more eastside work; more on estuaries, large rivers and oceans; more knowledge to link trends to recovery 	<ul style="list-style-type: none"> ■ Create new or expand existing centralized database to track projects, including methods and lessons learned. ■ Collect baseline condition on condition of Strategy Habitats and monitor change over time. ■ Compile summary of effective indicators (biotic and abiotic; one is being developed by USFS). ■ Monitor Strategy Habitats at landscape level to determine changes in extent, patch size and fragmentation/connectivity. ■ Monitor select Strategy Habitat sites within Conservation Opportunity Areas to evaluate habitat quality. ■ Oregon Plan identified challenges: stable funding; interagency coordination; effectiveness monitoring. ■ Maintenance and monitoring of focal points for biodiversity conservation

(b) Status monitoring:

Example Efforts	Gaps and Issues	Priorities
<ul style="list-style-type: none"> ■ Oregon Benchmarks ■ Oregon Plan: OWEB monitoring team; salmon populations and watershed health ■ Pacific Northwest Aquatic Monitoring Partnership (PNAMP) ■ State of Oregon Riparian Restoration and Management Policy (OWEB, DLCD) ■ State of Oregon freshwater wetlands assessment (DSL) ■ Water quality: <ul style="list-style-type: none"> ○ Watershed Councils' Citizen-based water quality monitoring (OWEB) ○ TMDLs (develop and implement 2004-2010) (ODEQ) ○ Agricultural Water Quality Plans (ODA) ○ City of Portland models used to assess watershed health ■ Climate ■ Fire frequency and severity (historic and current) ■ Oregon Gap Analysis Project ■ Environmental Monitoring and Assessment Program ■ State and local aerial photography and data ■ National Land Cover data sources: <ul style="list-style-type: none"> ○ National Land Cover Data ○ Regional Vulnerability Analysis ○ EROS Data Center ○ North American Landscape Characterization ○ Global Land Cover Characterization ○ Forest Inventory and Analysis ○ Landscape Analysis and Assessment ○ National Resource Inventory 	<p>Include and consider:</p> <ul style="list-style-type: none"> ■ Changes in land use and land cover over time (e.g., urbanization rates). ■ Spread rates for key invasive species. ■ Ecologic processes such as hydrologic function and biological interactions (e.g., competition, mutualism, predator-prey relationships). ■ Need effective biotic indices that incorporate several measures of ecologic integrity. ■ Identifying trends in habitat status will require repeated observations 	<ul style="list-style-type: none"> ■ Monitor priority limiting factors such as invasive species to determine status (i.e., increasing or decreasing?). ■ Develop scorecard to evaluate magnitude of issues. ■ Develop approach to show changes in habitat at fine spatial (less than 30 meters) and temporal (annual) scales. Satellite imagery currently useful for coarse-scale changes in vegetation, development and disturbance. ■ Consider more frequent satellite imagery, balancing additional costs for higher resolution and/or increased frequency ■ Consider working with USGS to enhance National Land Cover to include additional categories for natural landscapes ■ Work with Progress Board to implement new natural habitat benchmark ■ Evaluate Oregon Benchmarks to determine if additional benchmarks are needed to address Conservation Strategy goals. ■ Develop and test biotic indices for Strategy Habitats (e.g., The Nature Conservancy's Measures of Success program). ■ Implementing effectiveness monitoring is a continual challenge facing state water quality plans

Strategy Species (and other important species monitoring efforts)**(a) Effectiveness monitoring:**

Example Efforts	Gaps and Issues	Priorities
<ul style="list-style-type: none"> ■ Demonstration of Ecosystem Management Options (DEMO) – multi-taxa ■ Pacific Northwest Aquatic Monitoring Partnership (PNAMP) ■ Effects of fuels reduction on birds in south-west Oregon (Klamath Bird Observatory) ■ Effects of forest management practices on headwater amphibians ■ Aquatic macroinvertebrate monitoring to indicate water quality ■ Effects of conservation actions on rare plants (e.g., Nelson's sidalcea, pumice grape-fern, and Applegate's milk-vetch) 	<ul style="list-style-type: none"> ■ Identification and validation of the most representative parameters to monitor when implementing conservation actions in Strategy Habitats. ■ Limited use of effectiveness monitoring on private lands where government funds are being used to conduct management and/or restoration activities. 	<ul style="list-style-type: none"> ■ Develop relationships between and among species and their habitats (OSU INR; NatureServe; Universities; NCASI; Weyerhaeuser; other partners). ■ Support effectiveness monitoring efforts in Strategy Habitats and to benefit Strategy Species that address priority conservation issues. ■ Use existing conservation plans and efforts to determine priority actions. ■ Develop tools such as scoring system for species' traits that make them susceptible to limiting factors (e.g., scoring system for variable amphibian species' traits that could make them sensitive to climate change). ■ Work with private landowners to develop and implement effectiveness monitoring where government funds are being used for conservation actions.

(b) Status monitoring:

Example Efforts	Gaps and Issues	Priorities
<ul style="list-style-type: none"> ■ Oregon Bat Grid ■ Pacific Northwest Aquatic Monitoring Partnership (PNAMP) ■ Forest Carnivore Monitoring ■ Deer and elk herd composition and population trends ■ Game mammal, furbearer, and gamebird harvest ■ Landbird Migration Monitoring Network of the Americas (LaMMNA) (landbird migration monitoring improvements; coordination; data management) ■ The North American Breeding Bird Survey ■ Christmas Bird Counts ■ Bonney Butte Hawk Migration count ■ Spring and Fall migration day counts ■ Midwinter Aerial Waterfowl Survey ■ MAPS (Monitoring Avian Productivity and Survivorship) ■ Regional colony counts for Common Murres and Brandt's and Double-crested Cormorants via aerial photography 	<ul style="list-style-type: none"> ■ The following taxa are poorly monitored: invertebrates, amphibians, reptiles, and some birds (e.g., waterbirds and shorebirds). Protocols and programs are needed for long-term monitoring for these taxa. ■ Difficult to monitor Oregon frogs using calls, a protocol favored in some nationwide amphibian monitoring efforts ■ Knowledge of the level of effort sufficient for long-term monitoring (e.g., annual vs. every 3 years). ■ MAPS in oak and riparian habitats. ■ There are numerous gaps in the types and degree of monitoring needed to guide conservation actions to benefit Strategy Species. These are presented in the Strategy Species tables in the ecoregional chapters. ■ Federal funding is declining for T&E monitoring, especially for plants, which affects cost sharing and ability to monitor. 	<ul style="list-style-type: none"> ■ Support development of a coordinated bird monitoring program within Oregon and between Oregon and regional/continental levels. ■ Support the coverage of BBS routes with qualified participants (e.g., staff time, outreach, incentives). ■ Enhance BBS program for bird conservation (e.g., habitat relationships, methods to reduce bias, population estimates and objectives). ■ Support data collection efforts that contribute to quantitative habitat and population objectives (e.g., bird densities, demographics, landscape analyses) ■ Determine causal factors in population changes (e.g., vital rates). ■ Develop and implement monitoring programs for bird species poorly monitored by existing programs, both within Oregon and for migratory and wintering birds that breed outside Oregon (e.g., migration monitoring).

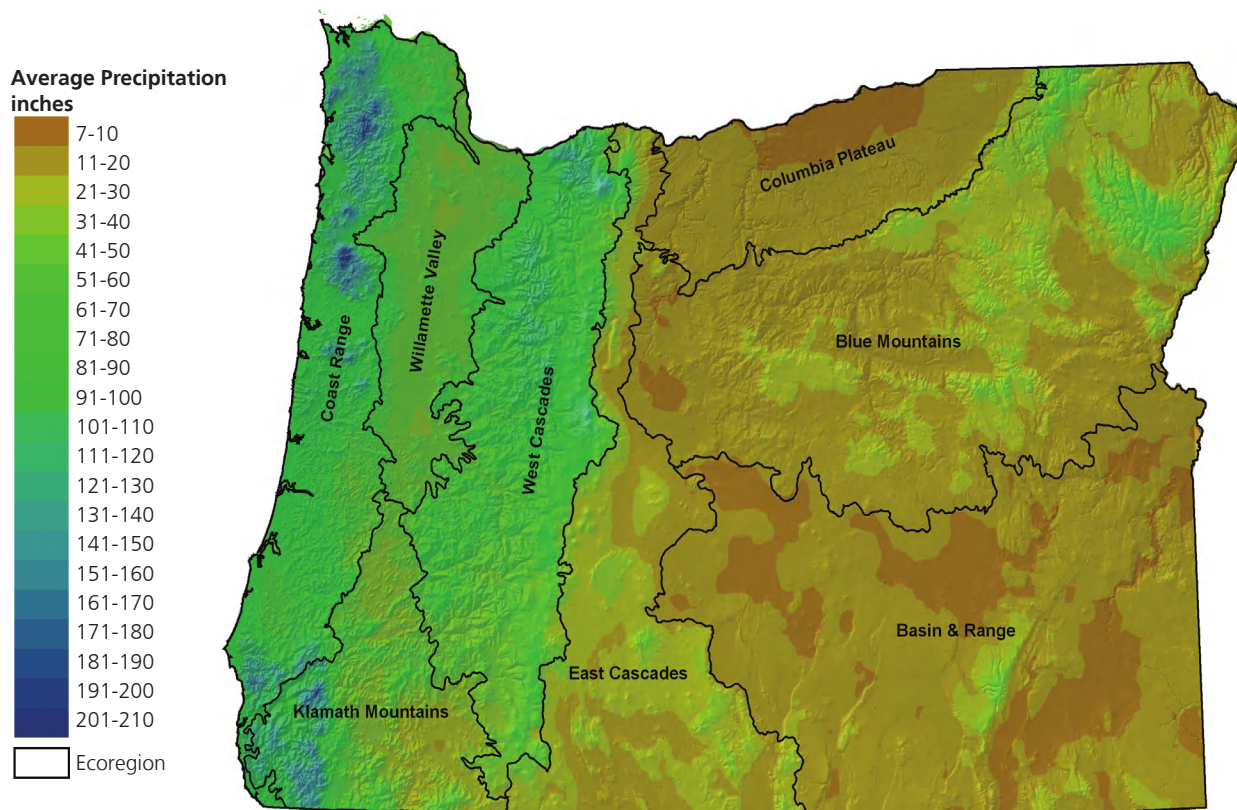
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(b) Status monitoring: (Continued)

Example Efforts	Gaps and Issues	Priorities
<p>(continued)</p> <ul style="list-style-type: none"> ■ Valentine's Day Herp Count ■ Fourth of July Butterfly Count ■ Dragonfly Migration Monitoring ■ Oregon Flora and Atlas Project ■ Forest Service monitoring ■ Threatened and endangered species monitoring (e.g., bald eagles, spotted owl, marbled murrelet, Fender's blue butterfly, Kincaid's lupine, etc.) ■ ODFW Native Fish Conservation Plan ■ Leach's Storm Petrel productivity and burrow counts (USFWS) ■ White-headed Woodpecker reproduction and survival ■ American peregrine falcon surveys ■ Northern goshawk population trends (USFS) ■ Terrestrial salamander monitoring (citizen-based national effort) ■ Greater sage-grouse (SageMAP) ■ USGS Amphibian Monitoring Initiative: spotted frog, western toad, Cascades frog, yellow-legged frog (distribution and/or breeding success). 	<p>(see previous page)</p>	<p>(continued)</p> <ul style="list-style-type: none"> ■ Identify population linkages of migratory bird between Oregon populations and their critical life history stages outside Oregon. ■ Track population and habitat changes in alpine habitats to evaluate potential effects of climate change. ■ Evaluate success of conservation programs (e.g., LIP, CRP) to provide appropriate conservation values for bird species and habitats. ■ Support the MAPS program in appropriate Strategy Habitats not already well-covered in the program (e.g., oak, riparian) ■ Support the BBIRD program (i.e., nest monitoring) for Strategy Species and/or in Strategy Habitats and also where opportunities exist to verify reproductive indices with MAPS. ■ Inventory and catalogue important sites for colonial nesting birds. ■ Develop and implement monitoring protocols for reptiles and amphibians ■ Produce products to provide technical guidance for citizen scientists (e.g., OWEB Water Quality Monitoring Guidebook) ■ Use current efforts and methods to evaluate species status over time (e.g., NatureServe's ranking system). ■ Determine Strategy Species status and relationships to natural and human-created factors over landscapes. ■ Assess demographic parameters (e.g., productivity, recruitment, survivorship) significant to Strategy Species at appropriate scales. ■ Establish species range benchmarks for Strategy Species. Track changes in distributions over time.

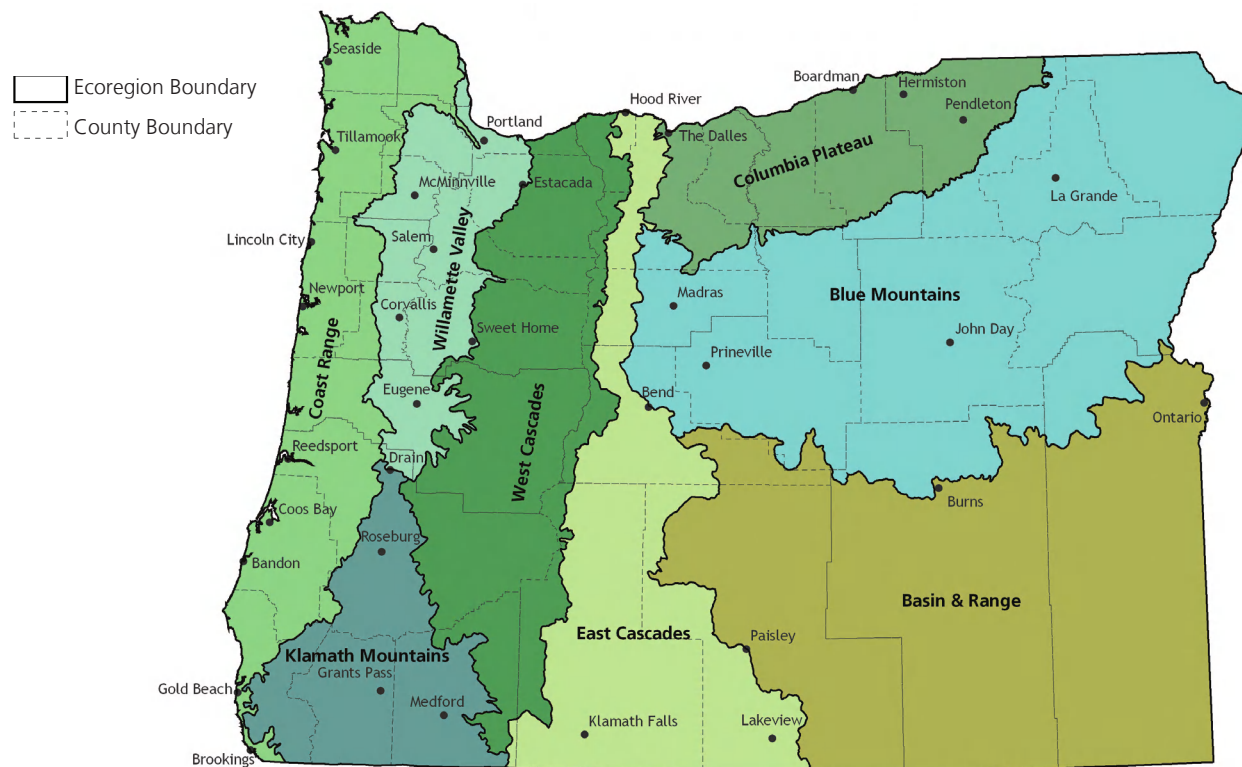


Oregon Average Annual Precipitation



Data Source: Oregon State University Spatial Climate Analysis Service

Ecoregions of Oregon



Data Source: U.S. Environmental Protection Agency