Restoring Riparian Habitats in Southern Oregon and Northern California:

A Guide for Private Landowners

Version 1.0

Applegate Partnership

Southern Oregon Land Conservancy

Jackson Soil & Water Conservation District

RVCOG

Lomakatsi Restoration Project

U.S. Fish and Wildlife Service Partners for Fish & Wildlife

The Beaver Coalition

Klamath Bird Observatory

Riparian habitat in southern Oregon. Landscape photo credit: Lomakatsi; Yellow Warbler photo credit: James Livaudais

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Cover photos: Provolt Recreation Area on the Applegate River, Provolt, OR. Photo credit: Karin Onkka. Song Sparrow. Photo credit: James Livaudais

Contributing Partners

Klamath Bird Observatory is a scientific non-profit organization that achieves bird and habitat conservation in the Pacific Northwest and throughout the migratory ranges of the birds of our region.

Emphasizing high-caliber science and the role of birds as indicators of ecosystem health, we specialize in cost-effective bird monitoring and research projects that improve natural resource management.

Recognizing that conservation occurs across many fronts, we also nurture a conservation ethic in our communities through our outreach and educational programs. We owe our success to committed donors, volunteers, staff, and partners who demonstrate that each of us can contribute to a legacy of abundant bird populations and healthy land, air, and water that supports birds and ourselves.

Lomakatsi Restoration Project is a non-profit, grassroots organization that develops and implements forest and watershed restoration projects in Oregon and northern California. Since 1995, Lomakatsi has a proven record of success implementing ecosystem restoration across thousands of acres of forests and miles of streams.

In cooperation with a broad range of partners, including federal and state land management agencies, other non-profits, land trusts, watershed councils, private landowners, city and county governments, and Native American tribes, our work has set precedents on nationally recognized projects. Lomakatsi provides expertise and capacity in project development, planning, management, fine-scale ecological treatment design, monitoring, and implementation - while integrating restoration practice with science delivery, education, and diverse workforce training.

Jackson Soil and Water Conservation District is dedicated to helping the people of Jackson County protect and conserve their natural resources.

We work with both individuals and communities to analyze and implement science-based solutions for various resource concerns, while still protecting the cultural, social, and economic values of Jackson County.

We provide free technical assistance and matching grants to private landowners, non-profits, and government organizations in order to support responsible stewardship across the landscape.

Southern Oregon Land Conservancy works with landowners and partners to protect and enhance land in the Rogue River region to benefit our human and natural communities.

We use two main tools to conserve land: holding conservation easements, and owning and caring for land. We also host a robust outreach program that includes youth natural science education, community hikes, and special events.

Applegate Partnership and Watershed Council is a community-based non-profit organization whose mission is to promote ecosystem health across the Applegate watershed through stewardship, education, and restoration carried out in partnership with private landowners, agencies, and other interested parties while contributing to local economic and community well-being.

The Beaver Coalition works to empower humans to partner with beavers through education, science, advocacy, and process-based restoration.

We are a coalition of optimistic, pragmatic professionals working to support a paradigm shift in how humans and beaver can live and work together.

We are a resource for tools and information to help landowners and communities embrace human-beaver coexistence.

We see beaver as a symbol of what can be accomplished with cooperation and hard work when we come together for the benefit of land, water, and people.

Rogue Valley Council of Governments is a voluntary association of local governments and special purpose districts within Jackson and Josephine counties, serving as a planning, coordination, program development, and service delivery organization.

Currently, RVCOG has 23 members: 15 local governments and 8 other entities (special districts and higher education). We act as a catalyst to promote quality of life, effective and efficient services, and leadership in regional communication, cooperation, planning, and action in southern Oregon.

We provide senior and disability services, transportation planning, land use planning, community development, and natural resources support.

U.S. Fish and Wildlife Service
Partners for Fish and Wildlife Program works to efficiently achieve voluntary habitat restoration on private lands, through financial and technical assistance, for the benefit of Federal Trust Species.

Photo credit: Frank Lospalluto

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Summary

Riparian habitats are the interface between land and water. They include the vegetation – herbaceous plants, shrubs, and trees – that occurs at the edge of bodies of water like rivers, streams, ponds, and lakes, or in association with wet meadows and wetlands. These areas provide critical fish and wildlife habitat as well as ecosystem services, including natural flood buffers, water quality improvements, groundwater recharge, temperature moderation, and nutrient cycling. Unfortunately, many of our historical riparian habitats have been lost or degraded due to human impacts, such as flood control and development. Riparian areas represent less than 1% of the total land mass in the western United States, yet they host a tremendous amount of biodiversity. In urban, suburban, and rural areas, riparian zones often form corridors of green space that are used by animals as habitat to live in, or as cover allowing them to move through the landscape. Private landowners own and manage roughly 60% of the land area of the U.S. as a whole, therefore playing a key role in the future of conservation and land stewardship. While the majority of the total land area in southern Oregon and northern California is federally managed, riparian areas in the foothills and valley floors are more likely to be in private ownership.

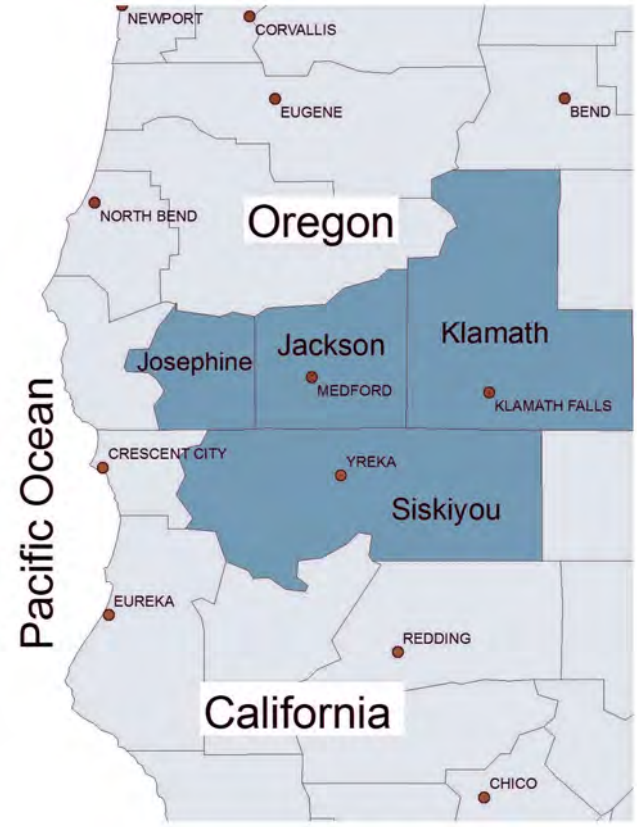
Riparian habitat in northern California.
Photo credit: Ian Ausprey

This landowner guide describes how to apply conservation practices for riparian habitats in southern Oregon and northern California.

An exciting opportunity exists for landowners and conservation partners to work together to restore native riparian ecosystems and their diverse wildlife communities.

This landowner guide describes how to apply conservation practices for riparian habitats in southern Oregon and northern California. This document discusses the importance of riparian habitats and the plants and animals that live there, and then provides detailed conservation guidelines for riparian restoration actions. Also included are supplemental resources for the restoration-minded private landowner, a list of organizations that can assist with private lands restoration, and step-by-step instructions for monitoring birds on your land to track the return of, or increase in, wildlife following riparian restoration activities. If you encounter an unfamiliar term in the text, turn to the Glossary page in *Appendix I* for the definition.

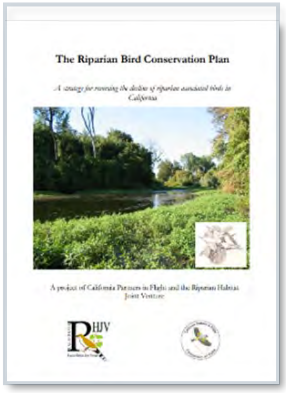
Geographic Scope



This landowner guide is generally applicable to riparian habitat in Josephine, Jackson, and Klamath counties in Oregon, and Siskiyou County in California.

Although guidance is targeted to these counties, some of the restoration principles and recommendations presented here are also relevant to those who manage riparian habitat in other regions.

Consider downloading one of these two documents published by Partners in Flight: *Conservation Strategy for Landbirds in Lowlands and Valleys of Western Oregon and Washington* and/or *The Riparian Bird Conservation Plan: A Strategy for Reversing the Decline of Riparian Associated Birds in California*.



They provide complementary information focused on conserving riparian lands for the benefit of birds and wildlife, including focal bird species, as well as imperiled species, the habitat attributes that support them, and guidance on meeting habitat objectives. A guiding principle of Partners in Flight conservation plans is that managing lands for a diversity of bird species - representing a suite of key habitat attributes - will support a diversity of other wildlife as well.

These documents can be downloaded for free at
http://www.prbo.org/calpif/plans.html and https://www.avianknowledgenorthwest.net/resources/conservation-plans/59-or-wa-pif-plans (note the Oregon-Washington plan will be updated with a new version in 2021, so check back again soon).

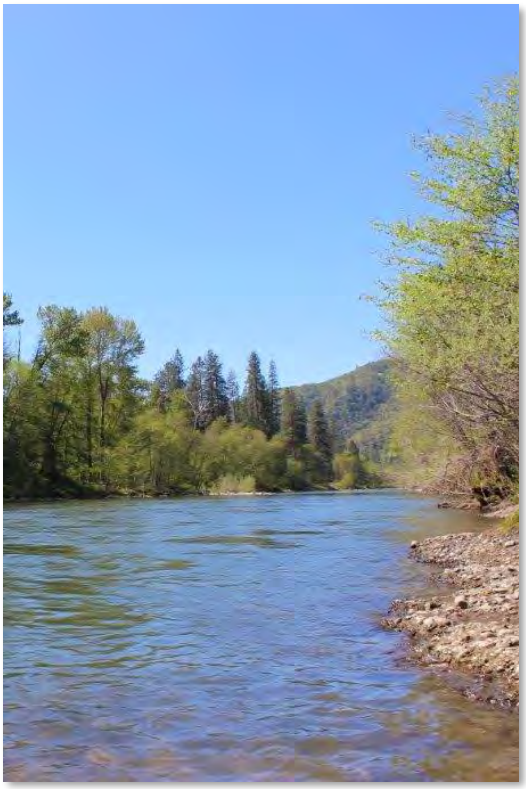
Value of Riparian Habitats

The word "riparian" comes from the Latin word *ripa*, meaning river bank. This unique habitat zone occupies the transitional area between terrestrial and aquatic ecosystems along waterways. Riparian areas provide a diverse set of benefits to both humans and wildlife. Beyond being aesthetically pleasing, healthy riparian habitat provides many important ecosystem services. Functioning floodplains can act as reservoirs that help absorb peak river flows, reducing downstream flooding. Riparian vegetation helps control erosion, stabilizes banks, filters out pollutants and sediments from surface runoff, and contributes to groundwater recharge by slowing the velocity of flowing water.

In western Oregon alone, over 350 species of vertebrates regularly use riparian areas, and many of these species are not found in drier neighboring landscapes.

Riparian zones are also among the most wildlife-rich habitats in southern Oregon and northern California. In western Oregon alone, over 350 species of vertebrates regularly use riparian areas, and many of these species are not found in drier neighboring landscapes. In the western U.S., riparian zones make up less than 1% of the land area, yet they support some of the most diverse wildlife communities found in arid and semi-arid

American Dippers – the only songbirds that swim – are common residents of western riparian areas year-round. They feed primarily on aquatic insects and are an indicator of good water quality. Photo credit: Frank Lospalluto



Riparian habitats are often considered beautiful, and provide many important functions for people and wildlife. Photo credit: JSWCD

Natural streambanks are critical for supporting fish populations, including these threatened coho salmon. Photo credit: Oregon Department of Forestry

regions like ours. Bird species richness can be up to 14 times higher in riparian areas than in nearby upland areas. This combination of relative rarity and high biodiversity makes riparian areas one of the most important habitats for the conservation of birds and other wildlife in the West.

Several characteristics of riparian habitats help explain why they are so important to wildlife. Proximity to water and a wetter microclimate result in higher plant productivity, greater resistance to wildfire, and more diverse vegetative structure compared to nearby upland areas. This increased productivity supports more abundant and diverse wildlife populations. Deer and elk, for example, benefit from increased availability of deciduous leaves. More green vegetation also supports greater insect biomass, which many other wildlife species rely on for food.

Mature riparian areas often contain a mixture of living and dead trees, or snags. Snags provide important wildlife cavities for nesting and roosting. Many riparian-associated bird species build their nests in cavities, including Tree Swallows and several species of woodpeckers. As the bark on riparian snags loosens, bats can roost in that space – they shuffle around the snag throughout the day to maintain the right body temperature as the sun moves through the sky. Small mammals like ringtails and raccoons rest in cavities in snags. Decaying snags also provide a source of important wildlife food items such as grubs, beetles, and other burrowing insects. Many turtles need floating logs from fallen riparian trees for basking. The dense shrub layer that is often found in riparian habitats provides cover for shrub-loving birds, like Wrentit and Yellow-breasted Chat, and also nesting habitat for dusky-footed woodrats. Voles, mice, shrews, squirrels, and muskrat also use riparian areas for nesting, shelter, and foraging.

Many of the same vegetation features that comprise healthy riparian habitat for birds and other terrestrial wildlife also provide benefits to anadromous fish, like salmon and steelhead.

Some waterways in southern Oregon and northern California are home to the North American river otter. Photo credit: U.S. Fish and Wildlife Service

Shade from a thick riparian canopy helps maintain water temperatures favorable for fish. Large wood material that comes from fallen trees and limbs shapes the in-stream habitat, creating pools and protective cover which are important components of fish habitat. Large wood structures in the stream also sort gravel, creating spawning habitat for salmon. Riparian vegetation provides beneficial nutrients to the stream ecosystem: falling organic debris and vegetation hauled into it by foraging beavers form the base of the food chain in many stream environments, supporting aquatic invertebrates that then feed fish, birds, and other larger animals.

Throughout the year, riparian areas provide important habitat for birds.

The roots of these riparian plants also filter pollutants and sediments from runoff, which increases water clarity and quality for fish.

Many reptiles and amphibians live in riparian zones, including species of conservation concern such as the western pond turtle and foothill yellow-legged frog. Other species like Pacific Coast aquatic garter snake, southern torrent salamander, coastal tailed frog, and western toad all either need riparian habitat or use it frequently. In fact, 91% of western Oregon and Washington reptiles and amphibians use riparian areas for breeding. Fallen trees and snags are important components of riparian habitat and are used as shelter by many species of reptiles and amphibians.

Mammals that dwell in riparian habitats include beaver, mink, river otter, muskrat, ringtail, and several species of bats. Many other types of mammals, such as cougar,

Tree Swallows and many other birds need snags or dead limbs with cavities for nesting. Here, a Tree Swallow nestling pokes its head out of a cavity nest. Photo credit: Frank Lospalluto

bobcat, deer, elk, fisher, black bear, coyote, and gray fox use riparian corridors to access water and migrate between upland habitats.

Throughout the year, riparian areas provide important habitat for birds. Resident species, such as Song Sparrow, Spotted Towhee, and American Dipper, use riparian habitats year-round, whereas many migratory birds, such as Yellow-breasted Chat and Yellow Warbler, use the riparian zone during the nesting season (from May to late July).

Willow Flycatchers, and many other migratory birds that typically breed outside of our region, depend on healthy riparian habitats for a place to stop during migration to rest and refuel before completing their journeys. Other migratory birds that breed farther north, like Golden-crowned Sparrow and White-crowned Sparrow, use riparian areas in southern Oregon and northern California during the winter months. Many of our local bird species that nest in coniferous forests often use lower elevation riparian habitats in winter.

Riparian habitats truly support rich communities of wildlife in every season.

Many of our local bird species that nest in coniferous forests often use lower elevation riparian habitats in winter.

Western pond turtles basking on a downed log. Photo credit: Frank Lospalluto

A History of Change and Future of Possibility

Fortunately, wildlife populations can recover.

Historically, riparian habitats in the Pacific Northwest in the lowland valleys were characterized by braided stream channels with forested islands, large logs, and a wide corridor of riparian vegetation – much wider than we see today. A mosaic of habitats, from early successional with pioneer plant species to more mature riparian forests, was maintained by frequent disturbance from flooding. Beaver were historically much more common and their engineering helped maintain a complex system of diverse wetland and riparian habitat. Riparian areas (then and now) typically have more hardwood trees than adjacent upland areas. Along smaller, headwater streams conifer trees become a more dominant component of riparian vegetation.

Youth from Helman Elementary School plant a native rose species along Ashland Creek during an annual plant-a-thon with Lomakatsi. Photo credit: Lomakatsi

A variety of factors have contributed to the loss of quantity and quality of riparian habitats. Flood control, irrigation systems, waterway channelization, wetland draining, beaver trapping, use of pesticides and herbicides, logging, and intensive development of bottomlands for urbanization and agriculture have all become increasingly common since the time of European-American settlement.

In some cases, overgrazing has degraded riparian ecosystems by compacting soils, reducing streamside vegetation, and preventing regeneration. More recently, non-native invasive plant species have added negative impacts in riparian habitats. For example, the invasive Himalayan blackberry (also known as Armenian blackberry) has greatly altered the understory in these habitats, reducing the number of shade trees and the diversity of shrub communities.

The loss and degradation of riparian habitats have led to real and negative consequences for terrestrial wildlife. Many of the bird species in the Pacific Northwest that are highly associated with riparian habitats have experienced range contractions and/or regional population declines. Habitat loss has affected other wildlife too, including fish (like threatened coho and chinook salmon, and steelhead), mammals, and insects.

Fortunately, wildlife populations can recover if appropriate habitat conditions are restored, giving animals a place to live, forage, and raise their young. Private landowners, by referring to the guidelines in this document, can play an integral role in returning healthy, wildlife-rich riparian ecosystems to the landscape, thereby leaving valuable legacy for future generations.

The Role of Private Landowners

The more active a role that a landowner takes, the more successful a restoration project will be.

Landowners and restoration practitioners learning about the benefits of an in-stream woody structure installed for riparian restoration in the Colestin Valley, OR. Photo credit: Jaime Stephens

In the Pacific Northwest, the percent of riparian habitat in private ownership tends to be higher in our lowlands and valleys. In urban, suburban, and rural areas, riparian zones often form an important greenway – a corridor of vegetation that is used by animals as habitat for breeding, foraging, and shelter, or as cover to safely move through the landscape from one natural area to another.

Fortunately, there are many reasons why landowners may decide to undertake riparian restoration. Riverside areas provide great opportunities for recreation, such as swimming, boating, and fishing. Riparian habitats provide excellent wildlife viewing, and it can be very exciting when new wildlife species appear in habitat created by restoration activities.

Restoring habitat can bring a lot of satisfaction and increase a property owner's connection to their land, as well as increase property values.

Two common barriers to riparian restoration are cost and lack of know-how.

The more active a role that a landowner takes, the more successful a restoration project will be. Two common barriers to riparian restoration are cost and lack of know-how. Numerous conservation programs exist that can provide expertise, assistance, and funding to help landowners with restoration planning.

What the Birds Tell Us

Birds are excellent indicators of riparian habitat health. Birds have diverse needs and each species depends on specific habitat features, such as cavities for nesting, shrub structure for cover, a tall tree canopy, or abundant insect populations for food. A riparian area that has all of these features – and can support many types of birds – will contain habitat components valuable to other wildlife as well.

By observing which birds occur on your land following riparian restoration, you can watch and enjoy the ecosystem returning to health. Birds provide a colorful, musical, and accessible window into the ecological function of your land that can increase your appreciation of the riparian habitat that you steward. See *Appendix IV: Monitoring Birds on Your Land* for more details on bird monitoring methods.

Focal Riparian Birds

The following riparian birds can act as indicator species for different aspects of healthy riparian habitat. A mix of these characteristics on the landscape provides the most habitat value for wildlife. Observing these birds can be very enjoyable, while also telling you a great deal about the condition of your land.

Song Sparrow

Time: all year

Identification: 6” long, streaked brown back, cream chest and belly, streaked sides and chest, front streaks coalesce into a dark central chest spot, brown and gray striped face

Where to find: in shrubs and small trees

Indicates: riparian shrubs in the early stages of development (a sign that new vegetation growth is on a good trajectory); can also occupy more mature riparian habitat

Photo credit: James Livaudais

Yellow Warbler

Time: spring and summer

Identification: 5” long, allover bright yellow, lightly greenish back, black eye and bill; females paler than males, males sometimes have darker rusty orange streaks on the chest

Where to find: shorter willows and taller canopy trees

Indicates: moderate to high canopy and subcanopy cover

Photo credit: James Livaudais

Yellow-breasted Chat

Time: spring and summer

Identification: 7” long; bright yellow throat and chest; white lower belly; olive-gray back and wings; dark mask; white spectacles, eyebrow, and ‘mustache’ stripe; long tail

Where to find: often in dense shrubs, but males will also sing from the tops of trees

Indicates: dense shrub cover

Photo credit: James Livaudais

Downy Woodpecker

Time: all year

Identification: 7” long, small woodpecker with small bill, black wings with white spots, white belly and center of back, black and white striped face, black tail with white outer tail feathers; males have a red patch on the back of their head while females do not

Where to find: trees and snags, along trunk or branches

Indicates: dead limbs or snags, also known as “wildlife trees,” that provide habitat for cavity-nesting birds, the insects they feed on, and other wildlife

Photo credit: James Livaudais

Black-headed Grosbeak

Time: spring and summer

Identification: 7.5" long; male (pictured at left): black head, thick black bill, orange back of neck, orange throat grading to yellow-orange belly, orange rump, black wings with white spots, black tail; female (pictured at right): paler overall, with a whiteish eyebrow and malar (cheek) stripe on a grayish-brown head

Where to find: mid-size to tall trees; occasionally lower down in shrubs

Indicates: taller tree canopy; mix of hardwood trees and conifers

Photo credit: James Livaudais

For more bird identification tips, and to listen to examples of bird songs,

visit the Cornell Lab of Ornithology's website: www.allaboutbirds.org.

A bonus bird to watch for:

Willow Flycatcher

Time: late spring and early summer, and again in fall (migrant only, and somewhat uncommon)

Identification: 5.5" long, drab olive-brownish back and head, white throat, dingy white or pale yellow chest and belly, two rows of white wing bars; easiest to identify from other similar-looking flycatchers by song – a buzzy, sneeze-like "fitz-beeew"

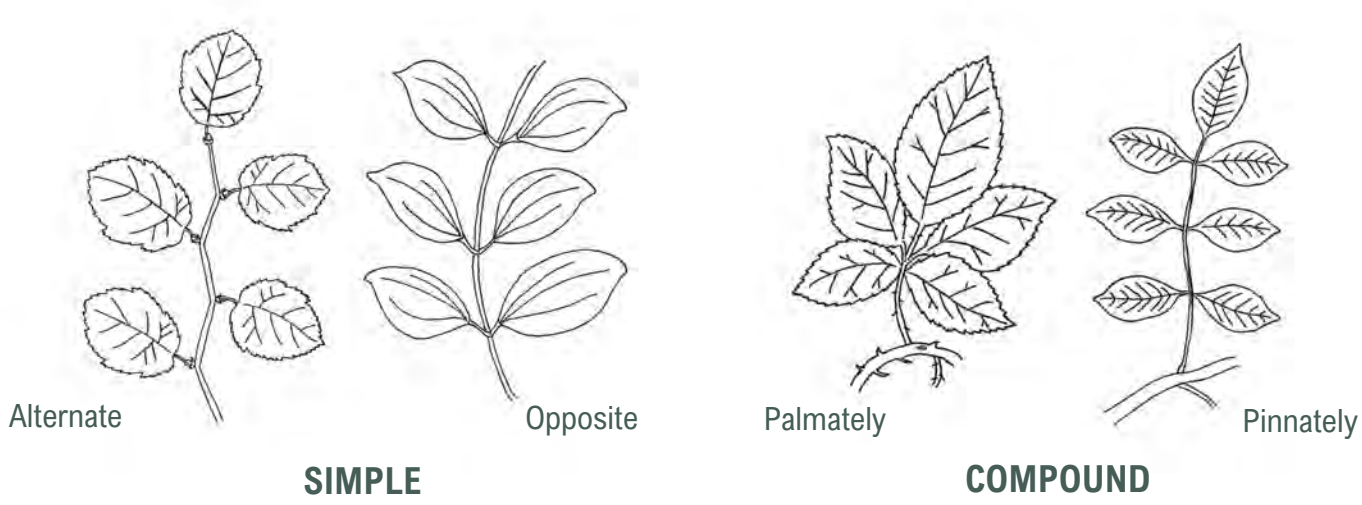
Where to find: dense willow shrubs

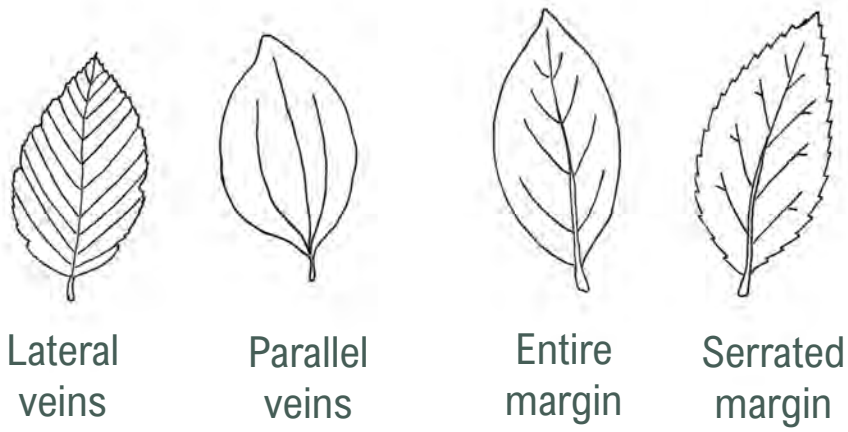
Indicates: a robust willow shrub layer with herbaceous openings

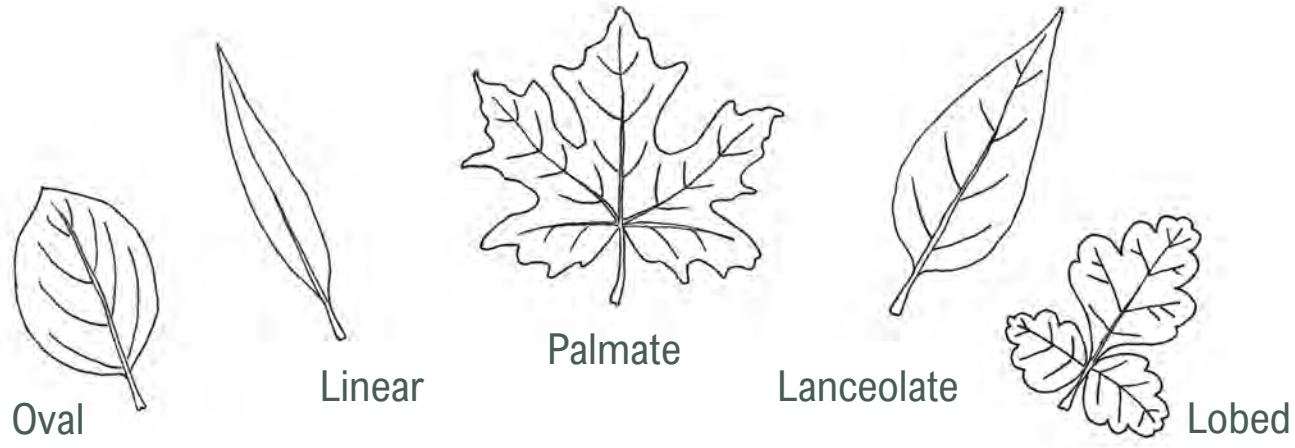
Photo credit: James Livaudais

Riparian Plants of our Region

The following sections will help you identify common native and non-native riparian plants of our region. The leaf diagram on this page illustrates terms used to describe leaf types that you will find in the plant identification descriptions.







Illustrations by Nate Trimble.

Native Species

Photo credits: Sarah Rockwell

Black cottonwood

Cottonwoods are trees that can grow up to 30 m (100 ft) tall. They are often one of the tallest tree species in a riparian canopy. Black cottonwood has deciduous, simple, alternate leaves that are typically teardrop shaped with finely scalloped edges. Leaf tips are elongated into points, and leaf bases are round to heart shaped.

White alder

Mature white alder trees are typically 15 m (50 ft) to 24 m (80 ft) tall, and often form an important component of a riparian canopy. Leaves are deciduous, simple, and alternate. Leaves tend to be oval shaped and serrated, with prominent lateral veins on the upper surface.

Photo credits: Sarah Rockwell

This native plant list is not comprehensive.

Other native trees in riparian areas can include conifers, such as

Douglas-fir, incense-cedar, white fir, ponderosa pine, or Pacific yew.

Photo credit: Sarah Rockwell

Oregon ash

Mature Oregon ash trees typically reach 11 m (35 ft) to 24 m (80 ft) in height. Leaves are deciduous, opposite, and compound, and can be egg-shaped to round.

Photo credit: Sarah Rockwell

Bigleaf maple

Bigleaf maple trees can grow to around 30 m (100 ft). Leaves are deciduous, simple, and opposite. Leaves are palmate, usually with five lobes which have large, coarse teeth. Leaves can be very large, sometimes much bigger than an outstretched hand.

Depending on habitat conditions where you live, other broadleaf hardwood trees may be present including cascara, aspen, various oak species, or California bay/Oregon myrtlewood.

Willows

Photo credits: Sarah Rockwell

Willows are a diverse group of plants that includes over 30 species of trees and shrubs in the Pacific Northwest. Different willow species vary in height, but are generally 2 m (7 ft) to 15 m (50 ft). It can be very challenging to tell one species from another. Native willow leaves are deciduous, simple, alternate, and usually lanceolate or linear in shape. Willows are short-lived and fast-growing, so they are often used in restoration to establish native habitat quickly. They are often one of the first woody plants to become established after a disturbance like flooding. Early spring willow flowers are

Photo credit: Nathan Gehres

Dogwoods

Dogwoods are a group of flowering plants that can be small trees or shrubs, depending on species and growing conditions. Leaves are deciduous, simple, and opposite, and have prominent lateral veins that curve parallel to the leaf edges. One common species in our region, red osier dogwood, has reddish twigs. Pictured is a young red osier dogwood planting with irrigation.

Skunkbush

Skunkbush is a shrub that can grow up to 2.5 m (8 ft) tall. Leaves are deciduous and alternate, typically have three lobes, and can have a pale green or grayish cast to their color. The leaves can be confused with those of poison oak. This species makes clusters of orange or red fruits that have sticky hairs.

Photo credit: Kristi Mergenthaler

Non-woody (herbaceous) plants like grasses and wildflowers are important for riparian habitat too.

Photo credit: Kristi Mergenthaler

Pacific ninebark

Pacific ninebark is a shrub that usually grows between 1 m (3.3 ft) to 2 m (6.5 ft) tall. Leaves are alternate, deciduous, serrated, and maple-like with three to five lobes. Flowers are white, rounded clusters. Ninebark's most distinctive feature is its many-layered bark; as the plant ages, long thin sheets of brown bark peel off of the branches.

Mock-orange

A shrub with showy white flowers that can grow up to 3 m (10 ft) in height. Leaves are oval and opposite with a pointed tip, and have three to five main parallel veins. Flowers often appear in clusters of about six.

Photo credit: Kristi Mergenthaler

Snowberry

Snowberries are typically small shrubs of about 1 m (3.3 ft) in height, but they can grow as high as 2.5 m (6 ft). Leaves are deciduous, simple, and opposite. Their relatively small leaves tend to be circular or oval-shaped, but some shoots can have larger lobed leaves on the same plant. Fruits are round white berries that can persist during winter.

Photo credit: Sarah Rockwell

Photo credits: Sarah Rockwell (left); Shutterstock (right)

Chokecherry

Chokecherry is a shrub or small tree that typically grows to between 1 m (3.3 ft) and 6 m (20 ft) in height. Leaves are deciduous, simple, and alternate, and have a broad oval shape with a pointed tip. Many plants in the cherry genus (*Prunus*), including the chokecherry, have a small pair of glands found at the base of the leaf blade. Chokecherries make elongated clusters of white flowers. Their smallish fruits hang in a dense cluster, and can be bright red, dark red, black, or yellow.

Some additional native (non-woody, herbaceous) species to consider planting include yarrow, Oregon sunshine, American wild carrot, tarweed, western bleeding heart, columbine, colt's foot, lupine, bear grass, tufted hairgrass, slender hairgrass, blue wildrye, Roemer's fescue, California fescue, California oatgrass, Lemon's needle grass, June grass, orchardgrass, and Sandberg bluegrass.

Currant/Gooseberry

There are about 30 species of currants and gooseberries in the genus *Ribes* native to the Pacific Northwest. They all have simple, palmately lobed leaves, and leaf clusters that are alternate in arrangement. Gooseberries typically have spines on the stems, while currants lack spines.

Photo credit: Kristi Mergenthaler

Photo credit: Kyle Strauss

Black hawthorn

A small tree or shrub that may grow up to 9 m (30 ft) tall. Leaves are deciduous, simple, and alternate. Leaf ends are round with serrated margins on the upper half only. Leaf bases are wedge-shaped. Branches often have stout thorns. A non-native species called English hawthorn can also grow in our area; it is similar, but has lobed leaves. This photo is of a small, relatively new planting.

Roses

Roses are a well-known group of shrubs and vines with conspicuous thorns and pink flowers. Leaves are compound and alternate in arrangement. Baldhip rose (west side; pictured) and Woods' rose (east side) are the most common native species in our region. Other native varieties include California, cluster, and Nootka rose. Invasive species of rose, like dog rose and sweetbriar, also occur in our region.

Photo credit: Kristi Mergenthaler

Identification of roses to species can be quite tricky, as different species tend to hybridize with each other. A general rule of thumb for differentiating invasive and native roses in this region is: if the rose has thick thorns that curve downwards, and the shrub is quite large, it is probably invasive. If the thorns are straight or more delicately curved, and the shrub is smaller, it is probably native. Non-native sweetbriar leaves smell like apple cider when crushed.

Photo credit: Nate Trimble

California (trailing) blackberry

This low, trailing shrub has more slender, delicate spines than Himalayan blackberry, and stems often have a whiteish or grayish cast. Leaves are deciduous and alternate, sharply serrated, and are usually composed of three leaflets. The undersides of the leaves also tend to have a whiteish or grayish cast. They produce a typical dark purple blackberry fruit.

Non-native Species

Photo credit: Sarah Rockwell

Himalayan (Armenian) blackberry

Himalayan blackberry is one of the most prevalent and pernicious invasive species in our riparian areas. This familiar plant forms mounds of dense, arching canes with thorns. Leaves are semi-deciduous and compound, with three to five leaflets per group, and often have small barbs on the underside. This plant makes a large crop of edible dark purple berries, and can provide wildlife habitat – but its presence also increases fire risk and can prevent native plants from establishing. Himalayan blackberry can also climb and kill trees by smothering them.

For guidance on how to remove invasive plants, see p.38

on non-herbicidal removal methods.

English ivy

This plant is a climbing, evergreen vine. Like Himalayan blackberry, it can form a monoculture where nothing else grows successfully, and it can also smother existing trees. Leaves are often dark green with distinct light-colored veins and three shallow lobes – but mature leaves can be glossy and unlobed.

Photo credit: Sarah Rockwell

Photo credit: Kyle Strauss

Purple loosestrife

This herbaceous perennial plant has a square stem and lance-shaped leaves in an opposite arrangement. When flowering, the plant makes long, striking stalks of pinkish purple flowers. They prefer wet areas and can displace native wetland plants.

Poison hemlock

Photo credits: Kyle Strauss

One of the most poisonous plants in North America, all parts of this plant are dangerous to humans and wildlife if eaten. Exposure to the skin or respiratory system can cause irritation, so always wear gloves when handling it, and wear face and eye protection if weed whacking. Poison hemlock stems are hollow and hairless, with distinctive reddish or purple spots and streaks near the base of the stem. Leaves are fern-like, with fine divisions and teeth, and have a strong musty odor when crushed. Poison hemlock can look quite similar to wild carrot or Queen Anne's lace, but these look-alikes have hairy stems with no reddish purple blotches.

Photo credits: Kyle Strauss

Puncture-vine

Puncture-vine, also known as goat's head, grows low and flat along the ground. Its leaves are pinnately compound and opposite in arrangement, and it produces small, bright yellow flowers. The dried fruits split into five sharp pieces capable of puncturing bike and car tires and the soles of your shoes. They also commonly get caught in the fur or feet of pets.

Japanese knotweed

Japanese knotweed can grow up to 3 m (10 ft) tall. The stems are hollow with purple speckles and remind some people of bamboo. Leaves grow in an alternate arrangement, and can be heart, shovel, or oval-shaped with a pointy tip. New leaves start out as dark red, then become green and rolled up with dark red veins before maturing into lush green leaves. Flowers are creamy white and grow in long clusters or spikes. It spreads primarily by rhizomes, which wash downstream during winter storms.

Photo credit: Kristi Mergenthaler

Scotch broom

Scotch broom is a midsize to tall shrub 1 m (3 ft) to 3 m (10 ft) in the pea family, with showy yellow flowers that mature into black fruits resembling pea pods. Leaves are relatively sparse and small, and are generally simple and alternate. The woody stems are green and young branches can be ridged. If possible, don't let Scotch broom go to seed! The seeds can be viable in the soil bank from 30 to 80 years. Not only can this shrub dominate meadows and understories, it also is highly flammable and can carry flames into the riparian canopy.

Photo credit: Kyle Strauss

Photo credit: Ben Legler

Shiny geranium

Shiny geranium typically has waxy or shiny (or sometimes sparsely hairy) leaves with five to seven deep lobes, flowers with five pink unlobed petals, and hairless stems that become redder in color as leaves age. Its sepals – the green structures that protect flower petals – are inflated and strongly ridged. This plant is a winter annual, meaning that it germinates in fall or winter rather than spring. It can form dense mats in riparian areas and forests, because it releases chemicals that inhibit the growth of other plants. A similar non-native geranium, dove's-foot geranium, has lobed petals and soft hairs on the stems.

Rush skeletonweed

Rush skeletonweed is a perennial herb that ranges from less than 0.5 m (1 ft) to 1.5 m (5 ft) tall. Stem bases have coarse, downward pointing brown hairs and are hairless toward the tips. Stems are highly branched and have few leaves, resulting in its skeleton-like appearance. Leaves at the base are long, narrow, lobed, and dandelion-like. The yellow flowers, in the aster family, are late summer bloomers and the seed heads resemble dandelion fluff. This plant exudes a latex sap when damaged.

Photo credits: Kristi Mergenthaler (left); Kyle Strauss (right)

Photo credit: Kyle Strauss

Dyer's woad

In the mustard family, this 0.3 m (1 ft) to 1.2 m (4 ft) tall herb has yellow cross-like flowers with four petals, green to black flattened pear-shaped dangly fruits, and blue-green basal leaves with distinctive cream- to white-colored veins. In our region, typically a cluster of basal leaves develops the first year, and the next year a flowering stalk emerges, flowers, and goes to seed. The stalk leaves also have whitish veins, and are simple and lance-shaped. All of the leaves have a cabbage-like texture. The taproot can be 1 m (3 ft) to 1.5 m (5 ft) deep. Dyer's woad is fairly well-established in Klamath and Siskiyou counties, and is a growing threat in Jackson and Josephine counties. It is also a threat to agricultural lands.

Yellow starthistle and knapweeds

Starthistle and knapweeds are in the genus *Centaurea*, a group of thistle-like herbs in the aster family. Yellow starthistle (pictured) is a winter annual that grows up to 1 m (3 ft) tall.

Photo credit: Sarah Rockwell

It has a spiny flower head, with spines in a star-like arrangement, and small yellow flowers. The seeds are short-lived, so a small patch can be easily controlled by pulling plants for a few years before they set seed.

Photo credit: Shutterstock

Starthistle first forms a basal rosette of leaves with a whitish-blue cast, and the stem is winged. It is poisonous to horses. Invasive knapweeds in our region include purple-flowered, spotted (can cause skin irritation upon contact), meadow, and diffuse knapweed.


Photo credits: Kristi Mergenthaler (left); Nathan Gehres (rt.)

Common teasel

Common teasel is a frequent invasive species in pastures and streamside wetland habitats in our area. It is a prolific seed producer, and cutting flowering heads or digging up the long dandelion-like tap root before it goes to seed are effective removal strategies. Their basal leaf rosette, formed in the first year of growth, is composed of large, puckered leaves, and is highly effective at smothering out competing species. As a biennial, this plant flowers in its second year, and the seed heads can persist through the winter. Stems are prickly. When it flowers, teasel can be recognized by its tall (up to 2.5 m, or 8 ft) flowering spikes with distinctive spiny flowering heads consisting of many small purple flowers. While goldfinches like to eat their seeds, an excess of teasel can overtake riparian habitat and reduce the diversity of other flowers, seeds, and fruit that wildlife rely on throughout the year. Other species of invasive teasel live in this region, including cut leaf and Fuller's teasel.

Garlic mustard

Garlic mustard is a 0.6 m (2 ft) to 1 m (3 ft) tall herb with kidney-shaped lower leaves and scalloped margins. Usually a biennial, the roots and young leaves smell of garlic and are edible to humans but not local wildlife. Second-year plants send up a flowering stalk with small, white, cross-shaped flowers that develop into long thin seed pods. This highly invasive plant can take over riparian understories, in part because it kills off surrounding plants with chemical compounds that inhibit their growth. Garlic mustard can self-pollinate and produces many seeds – up to 62,000 seeds per square meter.

Photo credit: Kyle Strauss

Photo credit: Kristi Mergenthaler

Perennial peavine, or everlasting pea

Vines can range in length from 0.6 (2 ft) to 2 m (7 ft) and emerge each spring from a perennial root system. Perennial peavine can cover the ground and sprawl up trees and shrubs, smothering native cover. The stems are winged and have long tendrils for climbing. Large showy pea flowers (up to an inch) may be pink to purple. The fruits look like garden pea pods. The blue-green compound leaves are alternate with pairs of narrowly ovate leaflets. Unlike the similar annual sweet pea, which is a common non-native ornamental plant, the flowers have no scent.

Thistles

Photo credits: Kristi Mergenthaler

Thistles are herbaceous plants that can grow up to 3 m (10 ft) tall with a familiar, spiny, often purple flower and a bulbous base. Leaves are long, narrow, lobed, and stems and leaves are often spiny or hairy. Non-native thistles, like bull thistle (right) or Canada thistle (left), can be a problem in riparian areas. However, native thistle species also occur in the West, and provide important habitat and pollen sources for wildlife. It is important to know which species you have before removal, yet identification can be challenging. If you need assistance with thistle identification, websites like https://weedwise.conservationdistrict.org/2017/thistle-identification.html can help, or contact your local university extension agent or native plant society.

More comprehensive lists of non-native, noxious shrubs and weeds in Oregon can be found at the Oregon Department of Agriculture's website (https://www.oregon.gov/oda/programs/weeds/).

The U.S. Department of Agriculture's plants database (https://plants.usda.gov/) also lists invasive and noxious plants by state.

Landowner Worksheet: Considering Riparian Habitat on Your Land

Take a moment to answer these questions regarding riparian habitat on your land. This will help direct you to the areas of this guide where your restoration efforts will have the biggest impact. Be aware that riparian restoration requires work and maintenance over multiple years.

Do you have a diversity of riparian vegetation structure? In other words, are there herb, shrub, and tree layers?	Healthy riparian habitat has a mix of vegetation types, such as young trees, old trees, snags, open areas, and shrubby areas. See **Diverse Habitat Structures** to learn how to promote this kind of habitat patchiness.	p.28
Do you have standing dead trees (snags) and fallen wood on your land?	Snags are very important for wildlife. See **Snags and Downed Wood** to learn more about snags and how to provide them.	p.30
How wide is your area of streamside vegetation (distance from edge of stream to edge of vegetation)?	Wider riparian corridors provide more room for wildlife to live and move between larger patches of habitat. Learn more in **Wider, More Connected Riparian Corridors**.	p.32
Is your stream a simplified, single channel? Can the water spill over into the floodplain during high water events?	Greater stream complexity, and greater connection of the stream to its floodplain, provide better fish and wildlife habitat as well as other benefits. See more in **Wider, More Connected Riparian Corridors.**	p.32
Do you have invasive shrubs or weeds in your riparian habitat?	Native plants are better for wildlife than invasive plants. See **Native Plant Diversity** to learn how to remove invasive plants and replace them with natives.	p.34
Do the riparian trees by your waterway provide substantial canopy cover and shade?	Canopy trees are important as bird habitat, and they provide shade that cools stream temperatures and benefits fish. Learn more in **Canopy Cover**.	p.40
Are your stream banks steep and made of exposed soil? Are you losing soil due to bank erosion?	When streambanks are unstable, soils and sediment erode into the waterway, reducing water quality. Learn techniques for stabilizing banks in **Stabilized Soils**.	p.42
Is your riparian habitat grazed by livestock?	Grazing can present challenges for maintaining healthy riparian habitat. See **Balanced Grazing** for tips on how to balance grazing with wildlife habitat needs.	p.44
Is your yard stream- and bird-friendly? In other words, is there a limited amount of lawn area, low use of pesticides and fertilizers, and a buffer of native vegetation between the lawn area and the stream?	See **Stream- and Bird-Friendly Yards** to learn how to create a vegetation transition between yard area and your stream, and other things you can do to provide more valuable habitat for fish and wildlife.	p.46

Desired Conditions for Your Riparian Habitat

What does healthy riparian habitat look like? Here we discuss eight desired conditions for riparian areas on your land:

1. Diverse Habitat Structures
2. Snags and Downed Wood
3. Wider, More Connected Riparian Corridors
4. Native Plant Diversity
5. Canopy Cover
6. Stabilized Soils
7. Balanced Grazing
8. Stream- and Bird-Friendly Yards

Each desired condition represents a characteristic of an intact, functioning riparian ecosystem that provides good habitat for birds and other wildlife. We present guidelines that will help you achieve each desired condition. Even if you cannot achieve all of the desired conditions, every effort helps restore our region's unique and valuable riparian areas.

Keep in mind that many riparian restoration actions will require approval and permits from various government agencies (state, county, and/or city).

We recommend contacting one or more of the numerous local agencies and restoration organizations that can provide expertise and support before starting a project (see *Appendix III – Help with Your Restoration*).

The type of stream running through your property (ephemeral, intermittent, or perennial) may affect the types of restoration actions that are most appropriate for your land. For instance, do you have a more forested, upland stream, or a more open, valley bottom stream? This guide was written primarily with valley bottom, fish-bearing streams in mind. However, if your stream is of another type, many of the potential restoration actions discussed here could still be beneficial for wildlife. Keeping non-fish-bearing streams clean and cool will also benefit fish-bearing waterways downstream from your land.

In general, healthy riparian habitat will contain: a mix of plant heights (herb, shrub, and tree layers) and successional stages (age or growth stage of the habitat), habitat patchiness (rather than evenly spaced plants), large understory volume (plenty of shrub cover), and a high percentage of native plants.

A healthy riparian system needs a mix of vegetation structures to best support wildlife populations. This diagram shows different riparian bird species and their preferred habitat attributes (diagram adapted from RHJV 2004).

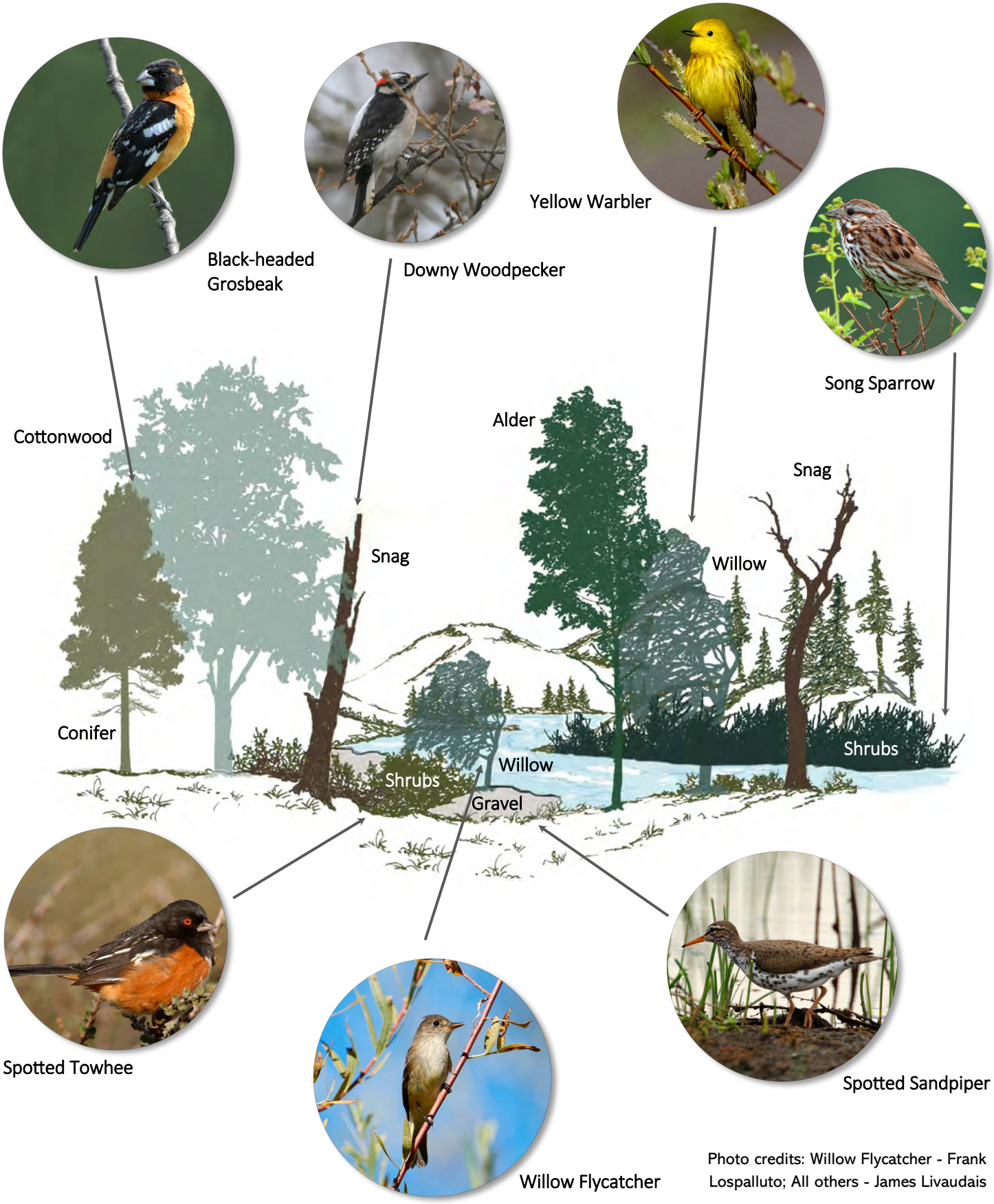


Photo credits: Willow Flycatcher - Frank Lospalluto; All others - James Livaudais

1. Diverse Habitat Structures

Significance

The diversity of wildlife in your riparian zone depends in part on the presence of important structural components of the vegetation, such as a mix of saplings, young trees, old trees, snags, open areas, and shrubby areas. High-quality riparian habitats have variability in the pattern of vegetation on the land, including clumping, open spaces, and areas of differing tree and shrub densities, rather than even spacing between plants. Large trees are critical for providing bird habitat as well as protecting stream temperatures from warming (which is beneficial for cool-water fish like salmon and trout). Early successional riparian plants, such as fast-growing cottonwood and alder trees, are good candidates for planting to create valuable shade. Native willow, dogwood, and snowberry are shrubs that fill in quickly, creating a dense understory. Many bird species nest on the ground or in low shrubs, and need a robust understory to reproduce successfully. Vigorous streamside vegetation also reduces the velocity of flowing water during high flow events, allowing groundwater to recharge, soils to rebuild, and stream channel complexity to form.

Take a Field Trip: Consider visiting a nearby intact or restored riparian area, or one where restoration work is in progress.

Viewing a site less impacted by development and invasive plants can increase your understanding of what a healthy ecosystem looks like. To locate a reference system, search for a reach of the same stream or a similar stream at a similar elevation, that is characterized by older, more mature trees and shrubs of the same native species.

Your local watershed council can provide you with places available to public access, such as Provolt Recreation Area near Grants Pass, OR.

A diverse bird community depends on a range of vegetation types, from shrubs mixed with herbaceous openings (used by Spotted Towhee, right) to taller woodland habitat (used by Western Wood-Pewee, left). Photo credits: James Livaudais

Threats

Threats include development of riparian areas for homes or other infrastructure, non-point source pollution such as runoff after rainfall, invasive plants, and disturbance to hydraulic function (including altering stream channels for agriculture or other purposes, installing storm drains, and releasing water from dams, which causes water levels to fluctuate rapidly).

Guidelines

1) Promote a diverse and vigorous understory layer of native shrubs and herbaceous species through plantings and regular care.
    - Retain and bolster native plants by regularly removing invasive species.
    - Encourage natural regrowth of desirable species, and plant a diversity of additional native species to complement what is already there.
2) Arrange new plantings in clumps (rather than evenly spaced) to more closely mimic natural vegetation.
3) Retain existing large trees on restoration sites, and enhance wildlife habitat by retaining or creating snags and downed wood (see the following section for more detail).
    - Large, in-stream wood structures, such as debris from fallen trees, snags, or large branches that settle into the waterway, help bolster habitat for breeding salmon and other fish.
4) Avoid conducting restoration activities that cause disturbance, like invasive species removal, fuel reduction, and native plantings during the songbird nesting season (Apr 15 – Jul 31).
    - Fall is the ideal time for new plantings, so abundant seasonal rainfall can help them become established.

Additional Considerations

Process-based or passive restoration is an often low-tech strategy for working with nature to restore natural processes and encourage natural regeneration with minimal human intervention. For example, when faced with a disturbance like flood, fire, mudslide, etc., a landowner could choose to allow it to occur, which can naturally break up monocultures of invasive plants. One can adopt a "wait and see" strategy following disturbance, where the land steward monitors the natural recovery process, and assists with passive restoration by removing invasive plants and perhaps adding additional native plantings to complement natural regeneration as needed over time.

An example of intact riparian habitat in southern Oregon, where tall trees on the streambank provide shade for the stream, and a diversity of native plant species enhance habitat value for both aquatic and terrestrial wildlife. Photo credit: Rachel Werling

2. Snags and Downed Wood

Significance

Snags are standing dead trees, and these are essential for many wildlife species. Snags provide cavities for nesting birds, perches with good vantage points, and insects for food. Downed wood – or dead wood on the ground in various stages of decomposition – is important in soil development, provides beneficial nutrients to streams, and is essential for maintaining fungi and other microorganisms that are the foundation of woodland food webs.

Downed wood also provides habitat for small mammals, reptiles, amphibians, and insects, many of which serve as prey for animals further up the food chain. Large wood structures like trees that fall into the stream help create habitat for many fish and other aquatic animals.

Threats

Snags and downed wood are often removed as potential safety or fuels hazards, or for aesthetic reasons, especially on private lands, rather than recognized as important resources for wildlife. In moderation, snags and large downed wood do not contribute substantially to the spread of most ground fires, and can usually be safely retained in your land stewardship planning to promote healthy riparian wildlife communities.

Restoration Tools

Retention — One of the most valuable restoration tools is simply allowing existing standing snags and downed wood to remain in the riparian zone.

Snag creation – Snags can be cultivated in a riparian forest stand through thoughtful forest management and girdling (see below for details). Forest communities naturally proceed through a “stem exclusion” phase, where competition between trees results in some individuals that grow to maturity and some that die. Historically, those that died off became critical snag and downed wood habitat for hundreds of insects, fungi, birds, and mammals in North American forests. One option is to simply let this natural process occur.

Cavity-Nesting Birds

Tree Swallows (right) and Black-capped Chickadees (left) are two of several riparian-associated birds that need snags for nesting habitat, although soft or dead parts of living trees can be used as well. These species aren’t large enough to excavate their own cavities, so they typically use old nest holes originally created by woodpeckers.

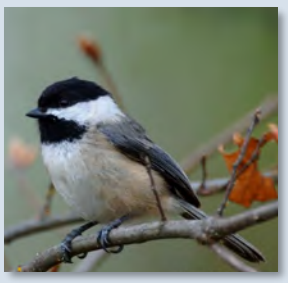


Photo credits: James Livaudais

Guidelines

Leaving brushpiles and woody debris through the winter is beneficial for California Quail (pictured), wrens, and several species of winter resident sparrows.
Photo credit: James Livaudais

1) Retain snags and downed wood for the benefit of wildlife.
    - Retain snags, especially those over 30 cm (12 in) in diameter, and dead limbs if at all possible (you may need to remove them near houses, barns, and sheds for safety reasons).
    - Retain some large dead wood on the ground, and consider leaving large trees and limbs on the ground if they fall naturally or are felled for other reasons.
2) Provide new snags if they are not abundant on your property.
    - Create a snag management plan that aims to have three to six snags per acre in the long-term. Ideally, snags are created naturally over time as trees grow old and die.
    - Aim to have snags of various sizes, tree species, and levels of decay.
    - In a riparian area with a high density of trees but no snags, you may consider killing select trees and leaving them standing as snags for wildlife habitat. This should be approached with caution in riparian habitats, where mature native trees provide critical habitat and shade, and thus are not appropriate for snag creation. If invasive tree species (such as locust, catalpa, or tree-of-heaven) or any obviously unhealthy native trees are present, prioritize these for snag creation.
3) In the short-term, providing artificial nest boxes and bat houses can benefit birds and bats where snags are lacking. These can be removed once natural cavities become available.
4) If there is a lack of standing dead and downed wood at the site, consider bringing in downed woody materials from other areas to support wildlife habitat. For fish habitat, restoration practitioners often place large wood structures—such as entire downed trees or large logs—into the stream channel. **Consult your local watershed council for information on these kinds of projects, as the design is often highly technical, and likely to require permits and benefit from expert guidance.**

Additional Considerations

Consider using downed wood as an anchor for new plantings. Select a good "micro-site" for the plant by identifying a specific location where it will grow well. A stump, for example, can provide a small planting with shelter from sun and wind, thus retaining more moisture in the soil and improving its odds of survival.

Snags and large downed wood are often mistakenly associated with increased fire risk. However, it is fine fuels like small branches, leaves, and grasses which tend to best carry fire. Standing and fallen large downed wood are rarely fully consumed during fire events. Removal of dead wood and snags within a certain distance of buildings, and following other Firewise guidelines, is still recommended. Check out Firewise USA, a program of the National Fire Protection Association, or consult with your local fire district or county emergency management department (for example, https://jacksoncountyor.org/emergency/Preparedness/Firewise) for more information on protecting your home from wildfire.

3. Wider, More Connected Riparian Corridors

Significance

Two types of habitat connection are described in this section.

First, habitat patch size and degree of connection to other habitat patches are important characteristics which influence which wildlife, including bird species, will occupy a riparian patch, and their population size. Not all birds migrate, and the ability to move between patches is essential for many species to maintain genetic diversity through individuals spreading out and mixing with other nearby populations. Birds (and small mammals, reptiles, and amphibians, too) can disperse more effectively if small populations can be connected by strips of habitat. Even narrow riparian strips that are too small to provide good nesting habitat can function as dispersal corridors for wildlife, helping them move among different patches. In contrast, small, isolated patches, with lots of habitat edges, may also increase the abundance of nest predators and brood parasites (birds that lay their eggs in other birds' nests, often lowering survival of the host birds' own young). Wider riparian corridors also increase the land's resilience to natural disturbances, and allow for more beneficial woody materials to enter the waterway.

Second, it is important for streams to be connected to their floodplains, meaning that they occasionally spill over onto the floodplain during high flow events. Many streams have been altered and highly channelized over the past decades due to agriculture and urban development. Historically, these streams were meandering, braided systems that supported wetland habitat by regularly spilling over into floodplains. Reconnecting streams to floodplains spreads more water around riparian areas, which allows a wider range of plant species to grow. In turn, more vegetation further slows the flow of water, increasing groundwater recharge. This creates side channels which provide fish rearing habitat and conditions favorable for the return of beneficial species such as beaver.

Aerial photo showing two larger riparian forest patches connected by a narrow riparian corridor.
Photo credit: Google

Threats

Urban and rural development has fragmented riparian habitats, reducing patch sizes and the degree of connection between habitat patches. Development and over management (such as the removal of beneficial trees and shrubs) can cause channelization and streambank scour, leading to disconnection of the stream from its floodplain. A lack of disturbance events — such as flooding of the streambanks during storm events — can limit the heterogeneity and diversity of the site.
A dynamic system is better for fish and wildlife.

Photo credit: James Livaudais

Homebody Birds

Wrentits are a highly sedentary bird that can be found in dense riparian shrubs of our region. They only move an average of 400 m (1/4 mi) away from where they were born in their entire lifetime! They don't migrate, aren't strong fliers, and won't cross big, open spaces – in fact, Wrentits often avoid flights of more than 10 m. They need well-connected riparian habitat patches to disperse and maintain healthy populations.

Guidelines

1) To improve a riparian corridor, consider restoring and maintaining riparian habitat within at least one to two tree lengths from the streambank, or 30-90 m (100-300 ft) depending on mature tree height. The corridor width you are able to achieve depends on many factors including the size of your property, site layout, what it borders, existing native vegetation patterns, current and future desired land use, and budget. Where 30 m (100 ft) or more is not possible, 8 m (25 ft) of riparian corridor is still better than less.

2) Small patches of riparian habitat – even those too small for birds to breed in – will have some benefit to wildlife and to the overall watershed, but to have the most benefit for the largest number of species, larger patch sizes of 10 acres or more are recommended where possible.

    - If the riparian area on your land is small in acreage, consider working with your streamside neighbors to restore a larger, continuous patch of high-quality riparian habitat.

Where safe to do so, allowing the banks of a stream to overflow during storm events can help create and maintain wildlife habitat.
Photo credit: JSWCD

3) Across large landscapes, connect patches of riparian habitat together through restoration efforts to optimize results.

    - More bird and wildlife species will occupy a riparian habitat patch that is close to other riparian habitat patches.

4) Where possible, connect separate patches of existing riparian habitat with strips of vegetation at least 3 m (10 ft) wide.

    - These vegetated dispersal corridors help wildlife move among patches to migrate, disperse, and maintain genetic diversity.

5) Help the waterway reconnect with the floodplain by reducing erosion and adding woody debris (see **Stabilized Soils** section).

Additional Considerations

This recent guide is a good reference for landowners interested in reducing stream channelization and reconnecting floodplains: https://lowtechpbr.restoration.usu.edu/. **Keep in mind that adding woody debris and other in-stream work will have permitting requirements.** Local watershed councils, restoration organizations, and government agencies may be able to provide advice, support, and resources – especially for larger efforts (see *Appendix III – Help with Your Restoration*).

4. Native Plant Diversity

Significance

Native trees, shrubs, and herbaceous plants (non-woody plants like grasses, sedges, wildflowers, etc.) are important components of riparian ecosystems. Native plants have evolved with native wildlife communities and tend to support wildlife better than non-native species. Many riparian habitats in our region today have understory plant communities that contain a high percentage of invasive vegetation, and look and function very differently from their historical, natural conditions.

Lomakatsi crew members plant native trees and shrubs along the banks of Bear Creek at a private land restoration project in Ashland, OR. Photo credit: Lomakatsi

Bird diversity in a riparian area tends to increase when two or more shrub species are present, and is much greater when there are seven or more species present. Other studies show that bird species diversity in riparian habitats increases with the number of different tree species present.

Native plants typically have longer root systems, which allow them to better filter pollutants, reducing the amounts that enter the waterway.

Non-native plants may not support as many insect food resources for birds and other wildlife as natives.

Non-native plants such as Himalayan blackberry have shallow root systems which can destabilize streambanks and accelerate erosion. The resulting additional sediment going into the stream compromises water quality, raises pollution levels (TMDLs, or total maximum daily loads) and threatens fish health by impacting salmon spawning beds (redds). When non-native plants become dominant, there can also be changes in natural fire regimes, as invasive species may not be adapted to our fire-prone ecosystem. The 2020 Almeda Fire, for example, spread quickly through the thick Himalayan blackberry patches along Bear Creek from Ashland to Medford, OR. Non-native plants may not support as many insect food resources for birds and other wildlife as natives. For these reasons, it is important to replace populations of invasive species with a diversity of native ones.

Shrub-loving Birds

Yellow-breasted Chats depend on a thick understory for nesting. While chats can nest successfully in non-native blackberry, they need lots of insects to feed their young – and non-native plants often do not provide the same amount of insect abundance as their native counterparts.

Photo credit: James Livaudais

Threats

Non-native species can outcompete and overwhelm native herbs and shrubs, and prevent native plants from regenerating. Grazing in riparian zones threatens native plant populations by increasing soil disturbance and creating openings for invasive species to grow. Livestock can also introduce non-native seeds to an area from their fur, hoofs, or manure. Invasive plants tend to dominate an area, reducing plant diversity, and leading to fewer bird species than areas with a greater diversity of plants. Natural seed dispersal of native plants is sometimes compromised due to the absence of high peak flows (seasonal flooding), so planting native vegetation can help.

Restoration Tools

- Planting and retaining native species
- Manual pulling of non-native species (see guide to **Non-Herbicidal Methods** in next section)
- Mechanical removal
- Chemical treatments (only when necessary)
- Seeding of native plants following ground disturbance

A Pernicious Plant

Himalayan blackberry is highly invasive, and can completely take over a waterway in a matter of years. The masses of dry canes found underneath the green growth are also highly flammable and may increase fire risk.

Photo credit: Kyle Strauss

4. Native Plant Diversity, continued

Native Pollinators

Riparian zones are an important source of habitat for pollinators, such as this bumble bee and pale swallowtail butterfly, both on native mint plants.

Photo credits: Robert Coffan

Guidelines

1) Before designing and implementing a restoration project, assess your site to identify native vegetation. Retain native trees, shrubs, and herbs and remove invasive plants.
    - Look for native plants that come up after non-natives are removed; germination from the seed bank is called natural regeneration. These seeds just need sun, moisture, and room to grow. Maintain weeding around these plants and patches.
    - Determine where to install new native plants to fill in gaps around existing native vegetation, especially in areas where invasive plants have been removed.
2) Avoid conducting restoration activities that cause disturbance, such as invasive species removal and native plantings, during the songbird nesting season (Apr 15 – Jul 31).
    - Fall is the ideal time for new plantings, so abundant seasonal rainfall can help them become established, and increase their chances of success.
3) Plant a wide variety of native trees and shrubs that complement the native species already present. Many different species are desirable, and the more the better—some successful projects have up to 20 different tree and shrub species. Diversity and complexity help make a healthier streamside forest.
4) When selecting new plantings, factor in soil conditions, sun exposure, and aspect (i.e., north-facing or south-facing) of different areas around the site—for example, species that will thrive along the creek's edge will be different from those that thrive farther upland. Different plant heights, growth patterns, and flowering times encourage a variety of bugs and wildlife. Consider fast-growing species like cottonwood, dogwood, and chokecherry that will establish quickly.
5) Mimic nature by clustering plantings. In nature we see individual trees in some areas, and clumps of trees elsewhere. Observe native species that are already growing well together, such as patches of rose, dogwood, or snowberry. We also see more open spaces where grasses and forbs grow. Aim to replicate this natural variation.
6) When possible, choose plants that are grown locally, from locally-harvested seeds. Choose a reputable nursery supplier (see list provided in *Appendix III – Help with Your Restoration*), and select healthy stock with well-established root systems.

7) Areas where vehicles or agricultural equipment regularly drive through, or creek access points like fords and irrigation diversion structures, can introduce invasive plant species that displace native riparian vegetation. Monitor disturbance at these sites, and control invasive plant species before they have an opportunity to expand. Reduce the footprint as much as possible to retain native vegetation.

Riparian Snags

Left: Standing dead wood, or snags, are an important component of riparian habitats.

Right: A Red-breasted Sapsucker leans into its cavity nest to feed nestlings.

Photo credits:
Frank Lospalluto

Additional Considerations

New plantings are likely to require support, such as wire cages that prevent deer browse, drip irrigation, and regular weeding, for three years or so to help them establish and thrive. Plants that are planted during the fall receive a full season of winter rain and have a greater chance of survival than those planted in late spring or summer.

A list of riparian trees, shrubs, and herbs to consider for planting is found in the **Native Species** section on p.14.

Keep in mind that many of these plants will grow best in different zones of your riparian area (for example, low and close to the stream channel vs. above the annual high water mark). Your local watershed councils and restoration organizations can help with planting designs.

Non-herbicidal Methods for Removing Invasive Plants

An impacted riparian zone's transition to a dynamic, ecologically functional streamside forest is dependent on the active role of the landowner. Landowners who do not want to use herbicides, or at least minimize herbicide use, will need to adopt a long-term strategy to manage their riparian site. A successful riparian restoration project requires the persistent removal of non-native plants while assisting the growth and establishment of diverse, native vegetation.

A Lomakatsi crew uses chainsaws and weed eaters to remove invasive Himalayan blackberry from the banks of Kitchen Creek at the Mountain Meadows Community in Ashland, OR. Photo credit: Lomakatsi

When beginning a riparian restoration project, first become familiar with your property. Identify any existing native vegetation before you remove any non-native plants. The native species already growing along your creek will serve as ecological anchors for your site, but can be hard to find in dense non-native vegetation. Conduct a thorough search during a time when deciduous plants have their leaves to ensure you don't accidentally remove any native plants. If restoration will be completed in the fall or winter, it may be necessary to mark the non-native vegetation for removal with flagging prior to the loss of deciduous leaves.

There are several ways to mechanically remove invasive plants. Some tools used for this work include flail mower, chainsaw, weed eater, hedge trimmer, loppers, McLeod, Pulaski, and shovel. Annual and biennial plants that propagate solely through seed dispersal, such as poison hemlock and teasel, should be mowed before they go to seed. This may need to be done for several years to exhaust the seed bank in the soil.

Stay on top of cutting back newly germinated seedlings. Plants with spreading roots, such as Himalayan blackberry, will need consistent mowing over time. Invasive blackberry populations will be reduced if their canes are cut multiple times a year. They diminish even faster when their roots are also removed. Most blackberry removal work should take place from early fall through late winter, when the energy of the plant is in the ground and not in cane growth, and when you won't disturb nesting birds.

To reduce new invasive plant infestations, there are a few actions landowners can take. After winter storms, or a couple of times per year, walk along your stream to look for any new plant species that may have washed onto your property. Besides the

noxious weeds listed in this guide, a number of ornamental or garden plants can be spread by floods, such as comfrey, periwinkle, and moneywort. Remove these plants before they become established. Additionally, when contractors bring heavy equipment to your land, ask that all equipment is first cleaned to remove seeds. Heavy equipment is a common vector for new weed populations. Removing invasive plants that are dominating your riparian zone will make space for the regrowth of native plants. Native seeds may have been sitting dormant in the soil for years and will now germinate as more sun, water, and space are made available. Once new native seedlings start to appear, prioritize the removal of any returning invasive plants around them. This encourages the process of natural regeneration.

Planting native trees, shrubs, forbs, and grasses will supplement the natural regeneration process, adding new seed sources and filling in spaces where unwanted plants used to grow. In preparation for each planting spot, all non-native vegetation, especially blackberry roots, should be removed. This limits weed competition and gives your plantings the best chance at survival. Give your plantings organic fertilizer to help them get established, and apply a thick ring of woodchips around their bases to retain soil moisture and keep out invasive weeds. Planting should ideally occur in the fall, so that new plants receive a full season of winter rain while they become established. Planting in the late spring or summer will decrease the probability of success, even with irrigation. For sites with tenacious weeds, plastic weed mats can be installed and removed once the planting is well-rooted. For small sites, sheet mulching with thick layers of cardboard and woodchips around native plantings can significantly slow the return of non-native plants.

Planting in rows, while unnatural looking at first, supports ongoing weed management and the installation of a drip irrigation system. Plan to irrigate and mulch your new plantings for three years to help them get established.

Consistent, long-term monitoring and stewardship is critical to riparian restoration. Hand pulling, digging, mowing, and weed eating invasive plants in between your native plantings two to four times per year will significantly reduce invasive plant populations over time. It is important to pull invasive weeds before they go to seed – and if they already have seed pods or fruits, then place pulled weeds into sealed bags for disposal to reduce the spread of these plants. If there is a large amount of material, you can also consider cutting it up finely and leaving it as mulch, or piling it and letting it compost.

Piling and burning, as long as it is not under the tree canopy, is also possible in accordance with local fire restrictions. For certain plant species, it is important to always bag and remove them from the site to prevent their spread – consult with local organizations listed in *Appendix III* if you are unsure of best practices. As non-native, invasive plant populations decline, and native trees and shrubs take hold, maintenance needs will lessen. In time, you will establish a healthy streamside forest that supports clean water and thriving native habitat for fish and wildlife.

A Lomakatsi crew adds woodchips around newly planted native trees and shrubs to help retain water and block invasive species from growing.
Photo credit: Lomakatsi

5. Canopy Cover

Significance

Good canopy cover has many benefits for riparian habitats. Some bird species prefer to forage and nest near the tops of trees. Studies in riparian habitats have shown that the number of different bird species occupying the habitat increases in areas with taller and larger-trunked trees. A leafy canopy also provides shade for the stream, which can help keep in-stream temperatures cooler and thereby enhance habitat for fish like salmon and steelhead.

Establish trees throughout your site.

Canopy cover throughout the site will catch and filter rain, slowing down the flow of water into the waterway. This reduces erosion and allows more water to permeate the soil, which improves conditions for riparian vegetation. Additionally, insects on the trees' leaves drop into the water, providing food for macroinvertebrates and fish.

Birds like Bullock's Orioles and Warbling Vireos forage for insects and build their nests in the canopy of riparian trees. Photo credits: James Livaudais

Threats

Native trees can have a hard time establishing and growing in areas of thick invasive plants, like Himalayan blackberry. When invasive understory is too thick, seeds from already established native trees are blocked from germinating, preventing the next generation from growing. Channelized waterways and the resulting absence of seasonal flooding removes an important dispersal method for native trees to spread their seeds.

Wildfire is an important process in western forests, yet it can result in reduced canopy cover, especially in upland tributaries that run through unnaturally dense forest stands, as well as in lower streams with high densities of invasive blackberry. Continued development for housing or agriculture, and the harvest of riparian trees for wood, also threaten canopy cover.

Plant trees along streambanks to provide future shade.

Create a diversity of canopy species.

Restoration Tools

Plant new native trees as needed, and remove invasive plants to make room for the next generation of existing tree species to grow (see **Native Plant Diversity** section starting on p. 34).

Guidelines

1) Plant trees along streambanks to provide future shade. It is important to plant trees along the south and west sides of stream channels so they will cast shade on the water.

2) Establish trees throughout your site for habitat and overall improved riparian function. Shade from trees helps establish new plantings. Plant trees, shrubs, and forbs that are less sun tolerant in the shade of trees, and consider successional planting — plant shade loving shrubs in year two or three when fast growing trees are starting to create shade.

Cottonwood and alder trees form a riparian canopy over Bear Creek, OR. Photo credit: Sarah Rockwell.

3) Create a diversity of canopy species, and consider the lifespan of different tree species, along with differing heights and growth patterns. Ensure a new generation of shade-bearing trees is growing so they can eventually replace older trees.

4) Canopy cover of 60-70% is a good target for providing shade for the stream, although this may not be realistic for all waterways.

Additional considerations

Prior to land clearing during the Euro-American settlement period, vegetated riparian areas typically spanned several tree lengths in distance from stream edges, providing much more abundant shade and temperature regulation of streams, and providing a transition zone between riparian and upland habitat. While most streams in our region are characterized by plant communities that include canopy tree cover, some spring-fed stream systems located in northern California and east of the Cascade Range include historic plant communities comprised of grasses, forbs, shrubs, and less canopy cover.

6. Stabilized Soils

Significance

The condition of streambanks plays an important role in overall riparian health. When streambanks are unstable, soils and sediment erode into the waterway, reducing water quality and accelerating the loss of riparian habitat. Over time, this erosion can increase channelization, which limits the ability of the waterway to access its floodplain, resulting in limited groundwater recharge and rebuilding of soils. Bank erosion and channel widening may result in loss of adjacent land and negative consequences for downstream landowners as well.

Native vegetation can help stabilize streambanks with their long root systems, reducing the harmful impacts of erosion. Native plants and stabilized soils also improve fish habitat by filtering pollutants, reducing sediment that can degrade spawning areas, allowing for higher levels of oxygen to dissolve into the water, and keeping water temperatures cooler.

Threats

The increasing channelization of waterways, and the deepening of channels over time, can result in steeper sloped banks and less stable soils. Streambanks cleared of native vegetation for development or agricultural use, or following a wildfire, are more prone to erosion and can allow more sediment and harmful pollutants to enter the waterway. Drainage pipes (from houses, industry, or municipal infrastructure) may cause concentrated runoff to flow into the stream, affecting the natural flow of water.

Restoration Tools

- Plant native trees, shrubs, forbs, and grasses
- Willow stakes and mattresses
- Largewood structures

Large wood structures were installed at this site to help stabilize the streambank and enhance habitat for fish in the creek.
Photo credit: Lomakatsi

Guidelines

1) Survey the site and identify areas with unstable soils, sloughs, and scoured banks in need of restoration.

2) Identify additional water sources that may be causing destabilization (drainage pipes from homes, spring water, storm runoff). If possible, redirect unnatural water sources that contribute to problems.

3) Select restoration methods based on the specific conditions of your site. In some cases, the streambanks might benefit from seeding of native grasses. In general, plant trees and shrubs where the ground is not extremely steep. On extreme steep slopes, using textiles or a willow mattress might be the best approach.

Top: A willow mattress installed to stabilize the slope and catch eroding soil along Anderson Creek in Talent, OR.

Bottom: A willow stake installed for slope stabilization and enhanced habitat along Anderson Creek in Talent, OR.
Photo credits: Lomakatsi

4) Clip 1-1.3 m (3-4 ft) long and 2.5-4 cm (1-1.5 in) diameter stalks from nearby willows and install them along the streambank, driving them at least 0.3 m (1 ft) into the earth. If possible, install these stakes deep enough so that they are in contact with subsurface water, increasing the likelihood that they take root. Under the proper conditions willow stakes will take root and grow into shrubs or trees that will help stabilize the streambank. The best time for this is late fall, winter, or early spring.

5) For a natural method of erosion control, install a mattress of woven willow along incised streambanks to help stabilize them. Alternatively, use textiles such as burlap, jute, or specific materials designed for erosion control. Log cribs – or horizontal logs that support soil retention – can be installed on steep slopes further from the streambank.

6) Consider installing large wood structures to slow the water flow and help reestablish the connection to the floodplain. Benefits include more time for water to absorb into soils, supporting riparian vegetation and groundwater recharge, and improving fish habitat by encouraging side channel formation as well as a mix of shallow gravel bottoms for spawning and deeper pools where fish can rest and hide.

7) Avoid performing restoration activities that cause disturbance during the songbird nesting season (Apr 15 – Jul 31).

Additional Considerations

Installing willow mattresses or large wood structures will most likely require permits. Local watershed councils, restoration organizations, and government agencies can provide advice, support, resources, and information on permitting requirements (see *Appendix III*). Or consider low-tech, process-based restoration techniques that bring back natural disturbance to your land, and may be simpler to implement on your own.

7. Balanced Grazing

Significance

Livestock can bring some benefits to riparian areas if properly managed. For example, they can help control invasive species, and may affix additional nitrogen in the soil. However, allowing livestock direct access to streams and other waterways can also destroy vegetation, introduce invasive plant species, increase erosion, and impair waterways when hoof traffic disturbs bank or stream bed soils. When deciding to graze animals near your waterways, it is important to consider the ecological effects and potential impacts to the streambank.

Excessive browsing can cause erosion, eliminate bird nesting habitat, reduce cover of native vegetation, compact soil, spread invasive seeds, and create opportunities for invasive species to establish. For many bird species, shrub cover is an important characteristic in choosing a nesting site, and reproductive success is one of the most important factors contributing to the health of bird populations.

Threats

Cattle and other grazing animals can inadvertently destroy bird nests by bumping into them, trampling them, or eating the plant the nest is built in. Grazing and browsing can also reduce vegetative cover, reducing the number of suitable nesting sites and potentially exposing nests to predators.

A cow with direct access to the stream. Note the lack of shrubs on the bank. Photo credit: JSWCD

Soil compaction from grazing can limit native plant growth, degrade wildlife habitat, and reduce the growth of young trees that would eventually provide shade. Excessive grazing can destabilize soils, increasing erosion, reducing water quality, and further threatening fish habitat. Manure can also create an excess of nutrients in the waterway, increasing the chances of harmful algal blooms.

Before and after photos from a riparian fence project on Butte Creek, OR. Cattle exclusion allows regrowth of the shrub layer to a healthier state. Photo credits: Mark Cookson

Restoration Tools

- Wildlife-friendly fencing to exclude grazing animals from sensitive areas
- Wire mesh to safeguard new plantings from browse
- Off-channel watering systems for livestock

Guidelines

1) Riparian fencing should be wildlife-friendly:
    - Bottom wire should be smooth and 46 cm (18 in) off the ground to allow small mammals to travel under the fence.
    - Top wire should be smooth and 102-107 cm (40-42 in) high to allow adult ungulates (deer or elk) to easily jump over the fence. The top two wires should be at least 30 cm (12 in) apart to reduce ungulate entanglements.
    - The two middle wires can be barbed if needed.
2) Consider alternatives to grazing in riparian areas whenever possible. If grazing must be done in riparian zones, carefully manage intensity and timing:
    - Avoid direct impacts to sensitive species, including shrub-nesting birds during the breeding season. Typically, this would mean only grazing in fall and winter.
    - Ensure that deciduous riparian shrubs are still vigorous and not completely eaten by livestock. Consider rotating cattle often to limit prolonged impacts to singular areas.
3) Use solar pumps on float valves to fill tanks away from riparian areas, so that livestock do not need direct access to water in the stream.
4) Control and harden locations where livestock and vehicles cross streams by fencing off riparian areas and using compacted aggregate to create a stable stream bed.

Grazing in Riparian Areas

Sensitive riparian areas are one of the toughest habitat types in which to balance grazing with wildlife needs. Cattle tend to congregate in riparian areas where bird diversity is also very high, and therefore the impacts of grazing in these areas are of particular conservation concern. Responses of birds often vary from species to species, but any level of livestock grazing is potentially detrimental to riparian landbirds, especially for species dependent on understory vegetation (shrubs). Multiple studies have shown that riparian bird abundance and species richness are greater in ungrazed areas compared to grazed areas, especially for birds that are riparian obligates. 46% of 68 migratory bird species that breed in western riparian habitats decreased in abundance with grazing. Complete exclusion of livestock grazing in riparian habitat is the most beneficial management action for bird populations. However, seasonal exclusion (e.g., fall and winter grazing only) with controls on intensity can still provide habitat for some species.

8. Stream- and Bird-Friendly Yards

Significance

While some people like the look of a manicured, homogenous lawn extending to the river's edge, this does not provide good habitat for wildlife. Healthy riparian zones need diverse native vegetation. "Soft" edges, or more gradual boundaries between areas of different vegetation or land use, provides a more natural, mosaic landscape. More abrupt, "hard" habitat edges can harbor more nest predators and brood parasites that impact bird nesting. Nest success, or the ability of birds to successfully raise young, is one of the most important factors determining whether birds can maintain viable populations.

Pesticides can reduce food sources for birds, which rely on local insect populations to feed their young during nesting, and to gain weight prior to migration. Many pesticides and herbicides are potentially toxic to fish and wildlife. Rodenticides are particularly dangerous to hawks, owls, and foxes (and to your own pets), who may eat rodents that become sluggish or die after being poisoned. These secondary poisonings of non-target species reduce the amount of natural rodent control that these predators provide. Fertilizer runoff can cause an excess of artificial nutrients in streams that can cause toxic algal blooms harmful to people and pets, and deplete oxygen for fish.

Natural disturbance, like occasional spring flooding, is an important ecological process that helps keep vegetative diversity high. Streams that can spill over into floodplains keep banks from becoming channelized, and help a wider range of plants to grow. This also helps create and maintain side channels which provide habitat complexity and places where adult fish can spawn and juvenile fish can grow. When a stream overflows its banks (accessing the floodplain), soils are replenished and stream energy is reduced, thus reducing erosion potential.

Keeping Birds and Cats Safe

Reduce the impact of non-native predators by keeping your cats indoors, or in an enclosed outdoor space like a "catio." Cats kill over 6 million birds per day in the United States, and even more small mammals, reptiles, and amphibians. Indoor cats also typically live longer than outdoor cats because they are less at risk of wildlife attacks, car accidents, and disease.

Avoid artificially increasing native nest predator populations by eliminating outdoor sources of food that attract rats, opossums, skunks, foxes, jays, and crows. Use selective bird feeders that exclude jays, crows, cowbirds, and non-native European Starlings. **Photo credit: Klamath Bird Observatory**

Be Firewise

Always follow Firewise guidelines to create defensible space around your home.

Check out Firewise USA, a program of the National Fire Protection Association, or consult with your local fire district or county emergency management department (for example, https://jacksoncounty or.org/emergency/Preparedness/Firewise) for more information on protecting your home from wildfire.

Guidelines

1) Whenever possible, limit use of pesticides and fertilizers.
    - Ask about less harmful alternatives at your local lawn and garden store, or explore websites like www.beyondpesticides.org/programs/safer-choice and www.raptorsarethesolution.org/.
2) Reduce other types of pollution from runoff.
    - Sweep driveways and patios rather than hosing them down.
    - Use permeable surfaces for your driveway and walkways; consider converting impermeable surfaces to gravel, grass, or permeable pavers.
    - Dispose of pet waste in the trash or toilet.
3) Create a buffer between any lawn area near your house that is mowed and/or fertilized and the river's edge – gradually transition it into riparian shrubland or forest.
    - Plants in a buffer zone will help filter the runoff from your lawn before it reaches the stream.
    - Lawns with some vegetative structure scattered throughout (shrub clusters, and single trees like pine or oak) strike a balance between lawn and habitat.
    - If the view is a concern, plant low-statured shrubs like Oregon-grape, snowberry, Douglas spirea, or other deciduous species to allow for longer views and better light in winter months.
    - Plant native forbs and grasses in openings rather than non-native lawn grass species.
    - Plant trees to create shade for fish, especially if you are on the southwest side of a waterway.
4) Avoid mowing of non-lawn areas during the songbird nesting season (Apr 15 – Jul 31).
    - If mowing is necessary (for example, if needed to comply with local fire regulations), maintain mowed areas at less than 15 cm (6 in) in height to discourage nesting in between mowing events. The idea is to avoid attracting birds to an area where they might nest in taller grass, and then mow over the nests, which would likely kill the eggs or young.
    - Remember that functional riparian habitat needs diverse, native vegetation.
5) Consider encouraging stream complexity by allowing the creek or stream to naturally overflow its banks during storm events where possible.
6) Consider leaving more water in the stream through reduced irrigation and water use.
    - Generally, a landowner with water rights may choose to leave the allocated water in the stream by changing the beneficial use to benefit fish and wildlife through transfers or leases, either permanently or temporarily. This preserves the water right for the landowner while also providing a huge benefit to fish and wildlife.

What to Expect After Restoration

A newly restored site may look somewhat barren and impacted at first, although some sites with an existing tree canopy may just have invasive plants removed from the understory. Lush thickets of invasive Himalayan blackberry may have been cut and removed or left on the ground as mulch. Large open areas are now the canvas for a new landscape to take hold. Small seedlings have been planted to establish a native streamside forest. This young woodland may be planted in rows for easier maintenance, while staggered plantings within rows will eventually provide the patchy, clumped spacing that mimics natural growth. Rows might have a drip irrigation system.

As your riparian habitat is restored, new wildlife species will likely appear.

Each planting may have caging for deer browse protection and mulch or mats to suppress weeds. Expect the need to manage invasive plants over the long-term, by removing them multiple times per year – any new growth will be much easier to manage if caught early, before it goes to seed. Himalayan blackberry in particular will need consistent management, like mowing, cane cutting, and root removal over time to be eradicated. These first few years are the most important time to successfully transition your property into a healthy native ecosystem, and efforts at maintaining the new habitat will be required.

After removal of invasive species, native snowberry seeds lying dormant in the soil have germinated and grown into a lush habitat along the streambank Photo credit: Lomakatsi

As your riparian habitat is restored, new wildlife species will likely appear. Trees will grow and native shrub thickets will spread, inviting a variety of mammal and bird species to forage, bed down, or nest. Beaver or otter might return, and you may have the pleasure of watching fall chinook salmon spawning on your property. Pollinators will find food, water, and shelter. Your reclaimed riparian zone will become a beautiful and peaceful sanctuary, a special place to enjoy a thriving native plant and animal community.

Left: Colored flags mark new plantings and cages protect young plants from deer. These may be left on for several years until the plants are established. Right: Irrigation lines make maintenance much easier and less time-consuming. They may be left in place for around three years before the plants are established. Photo credits: Lomakatsi

Living with Beaver

Restoration work resulting in improved riparian habitat may attract beaver populations. Beavers can drastically alter a location when they move in. Be prepared for flooding, tree removal, and a more natural, less manicured look. Remember that what may seem like aesthetic negatives are very big ecological positives. If beaver forage on native trees and shrubs in your yard's riparian zone, don't worry – these species have co-evolved with beaver and most often will sprout back with multiple stems, contributing to habitat complexity for birds and other wildlife.

Other tips:

- Plant a "food bank" of native plants preferred by beaver near the water's edge, like willow and red-osier dogwood, to create a "beaver buffer" that will keep them away from the rest of your landscaping.
- If beaver do start chewing on important landscaping plants, consider protecting them with a ring of 5 cm (2 in) x 10 cm (4 in) welded wire mesh supported by posts, or black plastic fencing tacked directly to the tree – either at least 76 cm (30 in) high.
- Make sure to allow plenty of room for the tree to grow. You can also protect trees by painting them with a mixture of sand and paint every couple of years; use at least 5 oz of clean dry sand for every quart of latex paint. Choose interior paint, as exterior paints often have heavy metals in them to keep the colors from fading in the sunlight. Choose a color to match your tree, or whatever cheap paint is available at your local shop.
- If beaver damming on a smaller stream is causing unwanted flooding in your yard, consider installing a pond-leveling flow device. Be sure to seek help from local restoration organizations or agencies so you don't run afoul of permitting requirements.

For more information on living with beavers, the Beaver Coalition (www.beavercoalition.org) and their Beaver Restoration Guidebook (www.beavercoalition.org/guidebook) are excellent resources.

A Landowner Success Story

John and Ramona Karns own property in Talent, Oregon, which includes a 500-foot stretch of Anderson Creek. Anderson Creek is a tributary to Bear Creek, which flows into the Rogue River near the town of Central Point. When the Karns purchased the land, the streambanks were inundated with 12-foot-high blackberries so dense that it was impossible to access the creek. There was no shade along the water, save for that provided by a large walnut and a few young Oregon ash trees. Native species were few and far between, and there was very little plant diversity.

A stretch of Anderson Creek on the Karns property in Talent before restoration efforts. Note how the blackberry entirely blocks the view of the waterway.

Concerned about the health of the waterway, and envisioning the potential of a thriving, beautiful riparian area, in 2015 John and Ramona contacted Jackson Soil and Water Conservation District (JSWCD) for assistance. While this stretch of the creek is not fish-bearing (there are fish passage barriers downstream of this project), it is an upper tributary providing water for fish downstream and therefore a priority for restoration.

The same stretch of creek after a Lomakatsi crew removed the blackberry with chainsaws and weedeaters. The shape of the channel is revealed.

The Karns and JSWCD, familiar with the work of Lomakatsi Restoration Project, invited the non-profit to help develop a riparian restoration plan. The landowners matched the funds provided by the District, and the Anderson Creek Riparian Restoration Project was initiated. The project goals included improving water quality through shade creation, soil stabilization, and nutrient filtration, while establishing sources of future downed wood and building healthy, functioning wildlife habitat.

During the initial site assessment, the creek looked like a straight channel with a giant blackberry blanket lying on top of it. A grape species, though native, was spreading rapidly and taking over areas where shade-bearing trees with deeper roots needed to be.

The same stretch of creek five years later, with an abundance of native trees and shrubs well-established on the streambanks.
Photo credits: Lomakatsi

The stream banks were extremely incised—some rising 20 ft high above the creek. Lomakatsi began restoration work in November 2015, and implementation was completed in two phases with two separate awards from JSWCD. The initial blackberry clearing, completed with a flail mower and a crew with chainsaws, surprisingly revealed a meandering stream channel with small strips of land along the water's edge, ideal for planting. Lomakatsi crews planted 650 native trees, shrubs, and pollinator plants. The landowner installed a drip irrigation system to help establish these plantings. Within these last five years, many trees that were planted have tapped into the water table. Black cottonwood and white alder are now over 15 ft tall, providing much-needed shade on the creek. To prevent erosion, willow stakes were planted along the creeks edge. Willow mattresses were installed providing a living lattice that catches soil from steep banks. Additionally, Lomakatsi installed logs (byproducts of ecological restoration at nearby forest sites) with rebar to stabilize upland slopes above the creek.

One of the key factors in making this such a successful project is the collaboration. John and Ramona not only invested financially in the project, they also made huge contributions of time and effort to the maintenance of the site. This maintenance has included ongoing removal of invasive plants, consistent irrigation, and continued planting of native species. These efforts have resulted in a very high rate of survival for the native tree and shrub plantings, which are now thriving. John and Ramona became involved in the process early on, and their willingness to play a large role in restoring their site has been a big part of its success.

One of the key factors in making this such a successful project is the collaboration.

A view from within the channel shows the start of a thriving riparian habitat with developing shade and a variety of native plants. Photo credit: Lomakatsi

John and Ramona have also been generous in allowing JSWCD and Lomakatsi to use their site as a place of learning. JSWCD and the Oregon State University Land Stewards Program have hosted several tours to show landowners what a riparian restoration project looks like at various stages of development. Many people have contributed to the site through Lomakatsi programs over the years, including community volunteers, school groups, and high school interns. Restoration has also been a multicultural effort, with contributions from Lomakatsi's Tribal and Latinx workforces helping to remove invasive plants and continuing to plant native species.

Once hidden in a tangle of impenetrable blackberry brambles, Anderson Creek is now a beautiful centerpiece of John and Ramona's property. Now they can walk down to the creek with their grandchildren and enjoy the shade of native willow, alder, and ash. Pollinators, birds, and other wildlife are enjoying the wealth of native plants. And John and Ramona can take pride in the central role they played in making it all happen.

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Appendix I – Glossary

anadromous – refers to fish born in freshwater, that migrate and spend most of their lives in the ocean, and then return to freshwater to spawn.

brood parasite – a bird species that reproduces by laying their eggs in the nest of another species, manipulating the host bird into raising their young. This often results in lower survival of the host bird's own offspring.

canopy – the upper layer or habitat zone in the trees, formed by the foliage of mature tree crowns.

cavity-nester – bird species that nests in holes excavated in dead or decaying trees, stumps, or logs. Primary cavity-nesters, like woodpeckers, excavate their own nest cavities, while secondary cavity-nesters use natural cavities or those used and then abandoned by primary cavity-nesters.

channelization – process by which a stream becomes incised with steep banks and little or no connection to its floodplain. This can happen directly by human activity (dredging and straightening stream channels to increase flow rates and carrying capacities), or indirectly (if there is an upstream dam, and flow rates remain constant without natural variation, the stream can cut down and become incised over time).

conifer – evergreen tree that bears cones and has needle-like or scale-like leaves that don't fall off in the winter. Examples include pines, firs, spruces, and cedars.

corridor – landscape or vegetative structure that enhances the movement of organisms between suitable habitat patches, especially when surrounded by inhospitable habitat. Corridors are important routes for the daily or seasonal movements of animals in fragmented landscapes.

deciduous – describes trees or shrubs that shed their leaves annually, usually in winter.

dispersal – one-way movement of an individual away from the area where it was born to a new area that it occupies as a breeding adult (natal dispersal). Can also refer to movements of fledgling or adult birds after they leave the nest area for places that they occupy before fall migration (post-breeding dispersal).

downed wood – dead wood on the ground in various stages of decomposition. Important for adding beneficial nutrients to soils and streams.

ephemeral stream – a stream that flows for very short portions of the year, usually only during snow melt or heavy rainstorms, and is dry the rest of the year.

evergreen – trees or shrubs that keep green needles or leaves all throughout the year. Examples include pines, firs, manzanita, madrone, and Oregon-grape.

fish-bearing stream – a stream used by anadromous fish (for example, salmon and steelhead), game fish, or fish listed as threatened or endangered. Both intermittent and perennial streams can be fish-bearing. Some streams may not be fish-bearing currently, but could be in the future if downstream barriers to fish passage are removed or spawning habitat is enhanced.

fledgling – a young bird that has recently left the nest. Parent birds typically continue to take care of fledglings for a couple of weeks after they have left the nest.

floodplain – area of low-lying ground adjacent to a river's banks that floods during high water events.

forbs – herbaceous plants (those with flexible rather than woody stems) other than grasses.

girdle – to cut through the cambium and sapwood layers around the circumference of a tree, interrupting the flow of nutrients and resulting in tree death. Sometimes used to create snags for wildlife.

herbaceous – describes plants that lack woody stems, including flowers, other forbs, and grasses.

heterogeneity – quality of being diverse in content, composed of many dissimilar parts, or not uniform.

indicator species – a species whose abundance can act as a metric indicating whether certain important habitat features are present, or whether the habitat is healthy and functional overall.

intermittent stream – a stream that flows for most or part of the year, typically during the wetter months in late fall through early spring, but does not always carry water during the summer dry season.

log crib – logs installed with rebar horizontally across a streambank, to stabilize the soil and provide a bench for plantings.

micro-siting – technique of planting a tree, shrub, or herbaceous plant in a specific location where it is likely to grow well.

monoculture – a single plant species growing over a large area, excluding other types of plants.

natural regeneration – the process by which woodlands or shrublands are revegetated by plants that develop from seeds that have previously fallen and germinate naturally.

non-point source pollution – pollution that comes from many diffuse sources (no obvious single point of origin, like a factory). Generally caused by rainfall or snowmelt moving over and through the ground that carries natural and human-made pollutants (runoff), and eventually deposits them into waterways.

perennial – a plant that lives for more than two years (an annual plant lives for one year; a biennial plant lives for two years).

perennial stream – a stream that is relatively permanent, and generally has water flow all year long – although a section of the stream may run underground for a short distance during dry periods.

redd – a spawning nest made by a fish, especially salmon or trout. Typically a circle 3-4 ft across of exposed "cleaned" gravel, with a depression in the center where the female lays her eggs.

riparian obligate – a species that only inhabits riparian zones and cannot thrive in other habitat types.

seed bank – the natural storage of seeds within the soil, often dormant and waiting for the right opportunity to grow.

sepals – the flower part that serves as protection for the flower in bud, and support for the petals when in bloom. Found at the base of the flower, they are typically green and petal- or leaf-shaped.

snags – standing dead trees, usually with hollow trunks or limbs.

succession – the gradual process by which plant communities develop over time. After a disturbance such as fire or flooding, an area will first be colonized by herbaceous plants, then shrubs, then conifers and hardwood trees. Successional stage refers to the age of the habitat: early successional is young habitat, while mid- or late successional habitat is a more mature, established plant community.

total maximum daily load (TMDL) – the maximum amount of a pollutant that a body of water can receive per day while still meeting water quality standards.

willow mattress – a structure of willow tree clippings woven together and staked on a streambank to prevent erosion and runoff during a restoration project.

willow stake – a stalk clipped from a live willow tree that is driven into the streambank, where it will sprout and grow into a new willow shrub or tree, enhancing habitat and reducing erosion.

woody debris – any dead woody plant material, such as logs, branches, dead trees, or root wads.

Appendix II – Plants and Animals in this Guide

Plants

Native

- Baldhip rose (*Rosa gymnocarpa*)
- Black cottonwood (*Populus balsamifera* spp. *trichocarpa*)
- Black hawthorn (*Crataegus douglasii*)
- Bigleaf maple (*Acer macrophyllum*)
- California blackberry (*Rubus ursinus*)
- California rose (*Rosa californica*)
- Chokecherry (*Prunus virginiana*)
- Cluster rose (*Rosa pisocarpa*)
- Currants/gooseberries (*Ribes* spp.)
- Dogwoods (*Cornus* spp.)
- Douglas spirea (*Spiraea douglasii*)
- Mock-orange (*Philadelphus lewisii*)
- Ninebark (*Physocarpus capitatus*)
- Nootka rose (*Rosa nutkana*)
- Oregon ash (*Fraxinus latifolia*)
- Oregon-grape (*Berberis aquifolium*)
- Red osier dogwood (*Cornus sericea*)
- Skunkbush (*Rhus trilobata*)
- Snowberry (*Symphoricarpos* spp.)
- White alder (*Alnus rhombifolia*)
- Willows (*Salix* spp.)
- Woods' rose (*Rosa woodsii*)

Non-native

- Bull thistle (*Cirsium vulgare*)
- Canada thistle (*Cirsium arvense*)
- Catalpa (*Catalpa* spp.)
- Dog rose (*Rosa canina*)
- Dyer's woad (*Isatis tinctoria*)
- English ivy (*Hedera helix*)
- Garlic mustard (*Allilaria petiolata*)
- Himalayan or Armenian blackberry (*Rubus armeniacus*)
- Japanese knotweed (*Fallopia japonica*)
- Knapweeds (*Centaurea* spp.)
- Locust (*Robinia* spp.)
- Perennial peavine, or everlasting pea (*Lathyrus latifolius*)
- Poison hemlock (*Conium maculatum*)
- Puncturevine (*Tribulus terrestris*)
- Purple loosestrife (*Lythrum salicaria*)
- Rush skeletonweed (*Chondrilla juncea*)
- Scotch broom (*Cytisus scoparius*)
- Shiny geranium (*Geranium lucidum*)
- Sweetbriar rose (*Rosa rubiginosa* or *eglanteria*)
- Teasels (*Dipsacus fullonum, D. laciniatus, D. sativus*)
- Tree-of-heaven (*Ailanthus altissima*)
- Yellow star thistle (*Centaurea solstitialis*)

Birds

- American Dipper (*Cinclus mexicanus*)
- Black-capped Chickadee (*Poecile atricapillus*)
- Black-headed Grosbeak (*Pheucticus melanocephalus*)
- Bullock's Oriole (*Icterus bullockii*)
- California Quail (*Callipepla californica*)
- Downy Woodpecker (*Picoides pubescens*)
- European Starling (*Sturnus vulgaris*)
- Golden-crowned Sparrow (*Zonotrichia atricapilla*)
- Red-breasted Sapsucker (*Sphyrapicus ruber*)
- Song Sparrow (*Melospiza melodia*)
- Spotted Towhee (*Pipilo maculatus*)
- Tree Swallow (*Tachycineta bicolor*)
- Warbling Vireo (*Vireo gilvus*)
- Western Wood-Pewee (*Contopus sordidulus*)
- White-crowned Sparrow (*Zonotrichia leucophrys*)
- Willow Flycatcher (*Empidonax trailii*)
- Wrentit (*Chamaea fasciata*)
- Yellow-breasted Chat (*Icteria virens*)
- Yellow Warbler (*Setophaga petechia*)

Fish

- Chinook salmon (*Oncorhynchus tshawytscha*)
- Coho salmon (*Oncorhynchus kisutch*)
- Steelhead/Rainbow trout (*Oncorhynchus mykiss*)

Mammals

- American mink (*Neovison vison*)
- Black bear (*Ursus americanus*)
- Bobcat (*Lynx rufus*)
- Cougar (*Puma concolor*)
- Coyote (*Canis latrans*)
- Deer, Mule or Black-tailed (*Odocoileus hemionus*)
- Domestic cat (*Felis catus*)
- Dusky-footed woodrat (*Neotoma fuscipes*)
- Gray fox (*Urocyon cinereoargenteus*)
- Muskrat (*Ondatra zibethicus*)
- North American beaver (*Castor canadensis*)
- Pacific fisher (*Martes pennanti*)
- Ringtail (*Bassariscus astutus*)
- River otter (*Lontra canadensis*)
- Roosevelt elk (*Cervus canadensis roosevelti*)

Reptiles & Amphibians

- Coastal tailed frog (*Ascaphus truei*)
- Foothill yellow-legged frog (*Rana boylii*)
- Pacific Coast aquatic garter snake (*Thamnophis atratus hydrophilus*)
- Southern torrent salamander (*Rhyacotriton variegatus*)
- Western pond turtle (*Actinemys marmorata*)
- Western toad (*Anaxyrus boreas*)

Insects

- Bumble bee (*Bombus* spp.)
- Pale swallowtail (*Papilio eurymedon*)

Appendix III – Help with Your Restoration

Assistance and Professional Guidance for Private Landowners

Numerous agencies, organizations, and conservation programs can help you with your riparian habitat restoration project by defraying costs, providing expertise, and offering other support services. Some riparian restoration work will require approval and permits from various government agencies. For instance, each county may be subject to their own regulations for riparian restoration activities, as well as additional ordinances that can be specified by each municipality. For municipalities without formal riparian ordinances listed, contact your city's Public Works and/or Planning Departments to ensure city permission is granted, in addition to following county ordinances. Contact the following organizations to learn more:

- USDA Natural Resources Conservation Service
- USDA Conservation Reserve Enhancement Program
- US Fish and Wildlife Service
- US Forest Service
- Oregon Department of Forestry
- Oregon Department of Fish and Wildlife
- CalFire, and California Board of Forestry
- California Department of Fish and Wildlife
- Land Trust Alliance
- Southern Oregon Land Conservancy
- Resource Conservation Districts (each county has their own, such as Jackson Soil and Water Conservation District, Josephine Soil and Water Conservation District, Klamath Soil and Water Conservation District, and Siskiyou Resource Conservation District)
- Rogue Valley Council of Governments
- Lomakatsi Restoration Project
- The Freshwater Trust
- University Extension Services
- Local Watershed Councils (including Rogue River Watershed Council, Applegate Partnership and Watershed Council, Scott River Watershed Council, etc.)
- Rogue Basin Partnership
- Wildlife Conservation Board
- National Fish and Wildlife Foundation
- The Nature Conservancy
- The Beaver Coalition
- The Conservation Fund
- Oregon Watershed Enhancement Board
- The Understory Initiative
- The Rogue Native Plant Partnership

Riparian Lands Tax Incentives and Rebate Programs

Here, we list a few common programs. You can also explore more online or contact your local government agencies and restoration practitioners to find out if there are others that may apply to your area.

The Farm Service Agency offers a **Conservation Reserve Enhancement Program**, in which a landowner can receive compensation for excluding property from grazing for a period of time (usually 10 years), and making ecological improvements. Contact your local soil and water conservation district, or visit this website for details: https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-enhancement/index#

Oregon Department of Fish and Wildlife offers a tax incentive program to property owners for improving or maintaining qualifying riparian lands. To learn more about this program, visit: https://www.dfw.state.or.us/lands/tax_overview.asp

Jackson Soil and Water Conservation District offers a rebate program to help offset costs of removing invasive plant species from riparian areas and replanting those areas with native trees and shrubs. Find more information by contacting the JSWCD office, or visiting this website: https://www.jswcd.org/riparian-restoration-rebate-program

Native Plant Nurseries

Several local nurseries offering native plants are listed here, but additional sources may be available in your area. Keep in mind that these businesses can change from year to year.

Plant Oregon: plantoregon.com
8677 Wagner Creek Road, Talent, OR 97540
541-535-3531 / dan@plantoregon.com

The Rogue Native Plant Partnership: roguenativeplants.org

Shooting Star Nursery: roguevalleynursery.com
3223 Taylor Road, Central Point, OR 97502
541-840-6453 / nursery@roguevalleynursery.com

Callahan Seeds
6045 Foley Lane, Central Point, OR 97502
541-855-1164 / callahanseeds@gmail.com

Silver Springs Nursery, Inc.
PO Box 341 Jacksonville, OR 97530
541-899-1065 / silversprings@gmail.com

Forestfarm Nursery: forestfarm.com
14643 Water Gap Rd, Williams, OR 97544
541-846-7269 / plants@forestfarm.com

Goodwin Creek Gardens: goodwincreekgardens.com
295 Northwest F Street, Grants Pass, OR 97544
800-846-7359 / info@goodwincreekgardens.com

Western Native Plants: westernnativeplants.net
28339 Hwy 87 N, Chiloquin, OR 97624
541-363-1050 / info@westernnativeplants.net

Siskiyou Arboretum and Native Plant Nursery
sgpga.org/programs/siskiyou-arboretum-native-plant-nursery/
310B Ranch Lane, Yreka, CA, 96097
530-327-8994

Native Grounds Nursery and Landscape Co.: nativegrounds.org
1172 S. Mt. Shasta Blvd., Mount Shasta, CA 96067
530-926-0555

Appendix IV – Monitoring Birds on Your Land

Observing birds can be a lot of fun and lead you to a greater understanding of your land. Birds are among the easiest wildlife to observe: they are abundant, often brightly colored, and many of them announce their presence with distinctive songs. It can be very rewarding to see your land provide for these animals as they go about their lives.

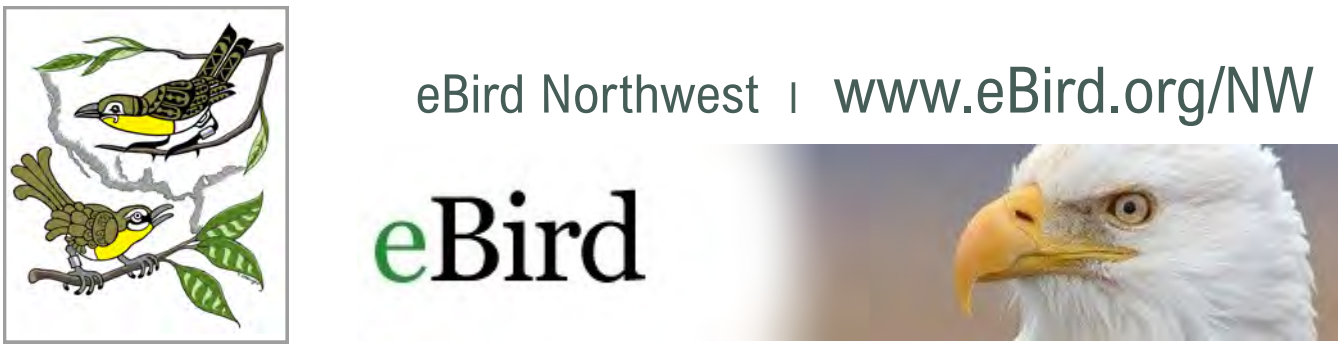
Birds can also tell you a great deal about the condition of your land. A single parcel of healthy riparian habitat can provide food and shelter for an amazing variety of birds. Some birds live year-round as residents on your land, others visit during migration to rest and refuel, and others spend either just the summer nesting season or winter non-breeding season on your land. By observing which birds occur on a parcel of land, we learn about its capacity to support wildlife and the benefits of your restoration activities.

Below are some simple directions for monitoring birds on your land. If you conduct bird surveys both before and after restoration activities, you'll be able to see the benefits of restoration for wildlife.

Photo credit: Graham Lewis

1) Choose a walking route on your land that will take approximately 15-30 minutes to complete.
2) Walk this route at the same time of day, preferably within four hours of sunrise when birds are most active, on an approximately weekly or monthly basis.
3) On each walk, record how many of each of the focal bird species you see or hear (see the **Focal Riparian Birds** section earlier in this guide to learn how to identify them). Be conservative when recording numbers of birds, trying not to "double count" individual birds. You may also record additional bird species you are able to identify. **See page 61** for an example datasheet to use for recording your bird sightings.
4) Use the eBird website (www.ebird.org/nw) to log your bird observations. By entering your observations in this database you will join one of the most significant community science programs in the world. **Visit page 58** of this guide for instructions on how to use eBird.
5) Have fun and share your knowledge of birds with friends and family. Over time, watch how your bird list changes as new species appear on your land and other birds increase in abundance.

eBird Northwest | www.eBird.org/NW



What is eBird? eBird is an online program that has revolutionized the way the birding community reports and accesses information about birds. Community members enter their bird sightings into eBird and then can view summaries, maps, and other representations of their data, as well as the data of other birdwatchers. The information also has tremendous value for scientists and educators.

What is eBird Northwest? eBird Northwest is a regional portal of eBird that engages communities in the Pacific Northwest.

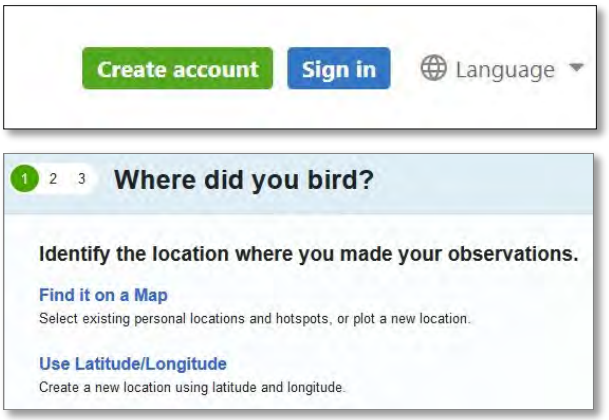
Why is eBird Important? Each person's bird sightings are joined with sightings from thousands of other participants around the world, and this wealth of information is used to understand, share information about, and protect bird populations.

Why is eBird Meaningful to You? You can use eBird to record and store your bird sightings while contributing to the understanding and conservation of birds. Using eBird is an enjoyable way to contribute to scientific efforts to safeguard our natural heritage.

Below are steps for getting started with eBird:

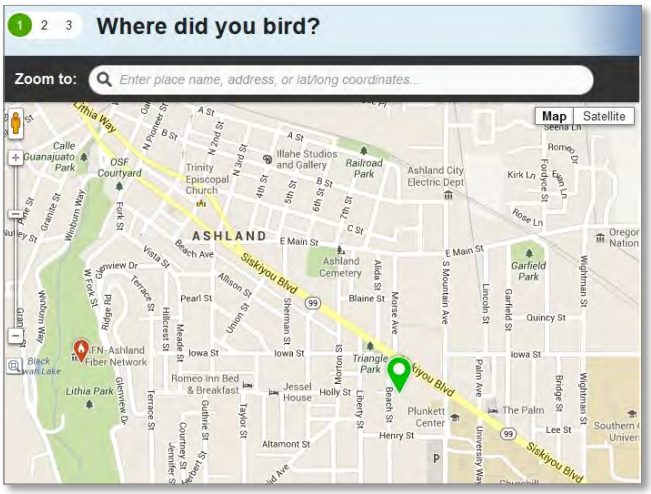
1) **Get online.** Go to this website: https://ebird.org/pnw/home

2) Sign in or register as a new user by clicking "Create account" in the upper right corner. In the menu bar, click the Submit button to start a checklist.



3) Enter a state under "Find it on a Map."

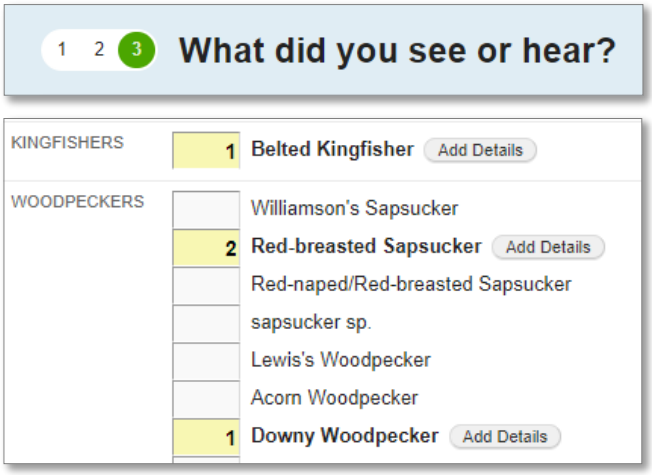
4) Zoom in to place a green marker on your property and give it a name (don't check "Suggest as a Birding HotSpot?" if you want to keep the location private).



Now it's time to enter your bird sightings:

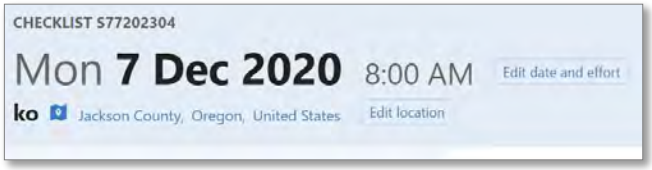
5) Enter date and survey time and effort information, then click Continue.

6) Enter the bird species you saw or heard, including numbers of individuals of each species. Use the list provided, or use the search bar to jump to a specific species.



7) Check "yes" or "no" depending on whether you are entering all the bird species you were able to identify.

8) Click "Submit" to finish.



eBird also has a mobile app for submitting your bird observations, which will automatically track the distance you travel and the time you spend collecting data.

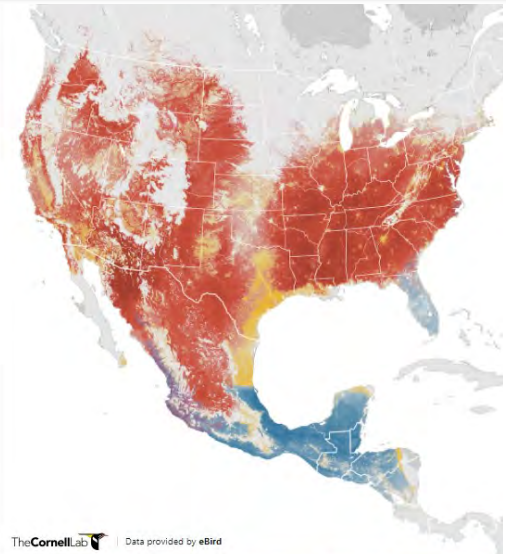
Download it from your app store, and then follow the directions listed here:

https://support.ebird.org/en/support/solutions/articles/48000957940-enter-sightings-with-ebird-mobile

Explore eBird Northwest

The eBird website offers interesting content and many ways to explore your personal bird observation data, as well as data entered into eBird by other users. The "News" tab directs you to news articles about birds and the Pacific Northwest. The "Submit" tab is where you will submit new bird observation checklists. The "Explore" and "My eBird" tabs allow you to look at the data in dynamic and fascinating ways. Play around with the website, and enjoy!

This eBird Abundance Map for Yellow-breasted Chat — a bird that breeds in riparian habitats in the western US — shows the predicted abundance for this species in North and Central America. Areas in darker red are predicted to have higher densities of chats during the breeding season; areas of lighter red are predicted to have lower densities (blue shows the non-breeding season, and yellow shows spring and fall migration). Many species have animated maps showing where the birds migrate in different parts of the year (see https://ebird.org/science). These are a few of the many tools eBird has for displaying bird abundance and distribution data.



Private Lands Riparian Restoration Project: Bird Species Checklist

Location:_____ Date: _____

Start Time: _____ End Time: _____

Distance Covered (~miles):_____ Total # of People in Party:_____

Observer Name(s): _____

Species Name	Tally	Species Name	Tally
Focal Species		Additional Species (write-ins)	
Black-headed Grosbeak			
Downy Woodpecker			
Song Sparrow			
Yellow-breasted Chat			
Yellow Warbler			
Other Riparian Species			
American Dipper			
Bald Eagle			
Bewick's Wren			
Black-capped Chickadee			
Bullock's Oriole			
Lazuli Bunting			
MacGillivray's Warbler			
Northern Rough-winged Swallow			
Orange-crowned Warbler			
Osprey			
Red-breasted Sapsucker			
Spotted Sandpiper			
Spotted Towhee			
Tree Swallow			
Warbling Vireo			
Western Wood-Pewee			
Willow Flycatcher			
Wrentit			

Please enter your bird observations into eBird Northwest: www.eBird.org/pnw/home. Thank you for your participation!!