

Fact Sheet #3: Functions of Riparian Areas for Wildlife Habitat

[This fact sheet was prepared by *Russell Cohen, Rivers Advocate*, **Division of Ecological Restoration, Massachusetts Department of Fish and Game**. This document is intended for educational purposes only and does not necessarily represent the viewpoint of agencies and commissions having regulatory authority over riparian lands. Last updated: June 11, 2014.]

What is the significance of riparian areas for wildlife habitat protection?

Riparian corridors (i.e., rivers, streams and adjacent lands) are particularly valuable habitats for wildlife. This includes many of what are ordinarily thought of as "upland" species as well as wetland species. For example, many upland animals need access to rivers and streams for hunting and drinking, particularly in the winter when other water sources may be frozen over. The junction between rivers, streams and adjacent riparian land is especially high in ecological diversity and biological productivity because gravity is constantly moving energy and matter along with the current, and because so many animals spend their lives both in water and on land. The high value of riparian areas as wildlife habitat is also due to the abundance of water combined with the convergence of many species along the edges and ecological transition zones between aquatic/wetland, aquatic/upland, wetland/upland and river channel/backwaters habitats.

Interaction between rivers and riparian lands helps create and maintain a high level of habitat diversity

Rivers play a major role in shaping the landscape and creating habitat for flora and fauna. The habitat along rivers and streams is as diverse as the watercourses themselves, ranging from cobble-strewn brooks to tidal creeks and wide floodplain rivers. Natural vegetation along higher-gradient rivers and streams provides large woody debris to the channel that helps form "pool-riffle" habitat critical to many aquatic species and the terrestrial species dependent upon them. Many low-gradient rivers and streams are sinuous by nature; that is, they tend to move about (meander) naturally, creating new channels and abandoning old ones. Natural features such as sandbars, undercut banks, oxbows (a U-shaped body of water that forms when a wide meander from the main stem of a river is cut off, creating a free-standing body of water) and floodplain pools resulting from a stream or river's interaction with adjacent lands are created, undergo change through time, and eventually disappear, while the overall pattern of the river (e.g., meandering, braiding) remains constant, at least on some larger spatial scale and longer time scale. This form of dynamic equilibrium is a singular property of rivers and accounts for much of the high biological diversity and productivity of riverine systems.

The dynamic equilibrium between the waterways and the land creates a corresponding dynamic equilibrium of life within a river system. For example, successive plant and animal communities occupy a meander loop as it is transformed from an active channel, to an isolated oxbow intermittently connected to the main flow during floods, and finally to a wet depression on the floodplain. As long as the river is allowed to freely interact with adjacent vegetated riparian areas, a diversity of habitats in various stages of ecological succession will be maintained. If, on the other hand, the channel is stabilized and isolated from the adjacent riparian area by retaining walls, levees and the like, the many organisms that depend on sandbars, undercut banks, oxbows, floodplain forests and other river-created habitats will begin to disappear.

Importance of riparian vegetation for wildlife

Vegetation (whether living, decaying or dead, standing or fallen) plays a key role in the function of riparian areas as suitable wildlife habitat. Streamside vegetation provides food and shelter for many species. Wildlife foods (seeds, buds, fruits, berries and nuts) are found in abundance within naturally vegetated riparian areas. The shade, detritus and coarse woody debris provided by streamside forests are very important for healthy fisheries, which are in turn a key food for many wildlife species. Leaves, branches, even whole trees uprooted by the river or other natural forces become food and shelter for aquatic organisms and the many forms of terrestrial wildlife inhabiting riparian areas. Logs falling into streams often divert stream flow into new pathways, increasing the complexity of the channel, which helps to maintain a diversity of habitat niches for riverine plants and animals. Last but not least, some wildlife inhabiting riparian areas, through their actions, create habitat for other wildlife species (beavers are the best known example of this locally).

Riparian areas serve as critical corridors for wildlife movement

Another characteristic of naturally vegetated riparian areas of particular value to wildlife is their connectivity function. River and stream systems are key elements of our state's ecological infrastructure. Besides serving as important dwelling habitat per se, undeveloped lands along river and stream corridors provide vital connective lifelines that enable wildlife movement necessary to maintain healthy wildlife populations. Loss of these connective corridors results in habitat fragmentation, which is a major cause of wildlife decline, and can even lead to extinction. For example, many species of reptiles, amphibians and mammals need the ability to disperse to new habitat to set up new territory for successful feeding and breeding. This allows for the continuous exchange of genetic material between species populations, a critical factor in maintaining species' resilience to disease and other adverse impacts. It is key, therefore, to maintain undeveloped and naturally vegetated corridors between habitats of a sufficient width to enable

animals to travel safely by land from one habitat to another. Allowing habitats to become isolated "islands" surrounded by development will cause them to lose much of their ecological value even though the habitat itself is not directly impacted.

Connections to uplands within and beyond the riparian area also perform vital ecological functions and need to be preserved as much as possible. Many species of amphibians rely on riverine habitat during the breeding season and then spend most of their lives in upland habitat, often at a considerable distance away. The reverse is true for many reptiles. Protecting riverine wetlands will not in itself safeguard the continued existence of the full habitat these organisms need. Protecting access to undeveloped uplands associated with adjacent rivers, therefore, is key to maintaining a healthy functioning ecosystem.

Riparian areas are important for common as well rare species

Although riparian areas serve as key habitat for a number of state-listed rare species of wildlife, it's important to remember that a naturally vegetated riparian area is considered to be significant for wildlife habitat protection even if no rare species are known to make their homes there. In addition to the fact that a number of migratory species, many of them rare, rely on undeveloped river corridors as migration routes, many of our more common resident species would nevertheless become threatened were they to lose the remaining undisturbed riparian habitat they depend upon. Furthermore, a particular riparian area may be performing an important function for wildlife habitat if it serves as a connection for species to travel between two adjacent areas providing good wildlife habitat, even if relatively few wildlife species are found residing within that particular riparian area itself.

What species of animals are dependent upon riparian areas for all or a portion of their life cycle?

Mammals: Many mammals, birds, reptiles and amphibians are dependent on undeveloped, vegetated riparian areas along rivers and streams in Massachusetts. Mammal species dependent upon the habitats provided by rivers, streams and associated ponds and wetlands include mink, muskrat, otter, water shrew, bog lemming, beaver and moose. Many other species, however, spend much of their lives within the habitats immediately surrounding our waterways; they are dependent on mixed upland and lowland habitat. Species in this category include everything from raccoon to deer, which often forage in the water, to our eight species of bats, which often forage on insects above the water. All of these species, as well as many others, occasionally use river corridors as travel routes.

Birds: Some species of birds found in Massachusetts are especially adapted to river life. The Louisiana and Northern water thrushes, for instance, are usually encountered in river corridors. The spotted sandpiper is frequently visible along river bars and shorelines. Many other shorebird species occur along rivers where appropriate mud bars develop. Belted kingfishers patrol rivers from the headwaters to the sea in search of small fish. Osprey flourish along rivers, and the state's largest nesting group of these birds is found on the Westport River. The state's many species of herons and bittern depend to a large extent on riparian corridors for food, roosting and nesting sites. Bald eagles frequent riverine corridors along the Connecticut and Merrimack Rivers in search of fish and roosting areas. Birds such as cormorants, night herons and gulls follow river systems for many miles inland in search of good feeding areas.

Rivers and their adjacent landscapes are also critical to Massachusetts' resident waterfowl. Black and mallard ducks and blue-winged and green-winged teal nest and raise their young in riverine marshes and wetlands. Wood ducks and hooded mergansers nest in tree cavities in swampy bottomlands. A less obvious river corridor user is the woodcock, or "timberdoodle", a terrestrial bird which follows and relies on vegetated wetlands within river corridors as its primary feeding and nesting habitat. Massachusetts is located in the "Atlantic Flyway", where three million waterfowl of 17 species migrate north and south each year. The northerly and southerly flowing inland rivers of the state, in addition to the coastline, provide direction, nesting and feeding areas for this great migration. River corridors are also major migration routes for many species of songbirds such as vireos, flycatchers, thrushes, tanagers and wood warblers.

Amphibians and Reptiles: The state's amphibians, which by definition require water or at least damp habitats in order to reproduce, frequently utilize riparian areas. At least one species, the mudpuppy salamander, is restricted to specific river drainages. Three semi-aquatic salamanders, the northern two-lined, northern dusky and northern spring salamanders, live in and along streams and small rivers in the state. The preservation of river corridors encompassing considerable upland habitat is required to maintain other species of amphibians, for many spend most or all of their lives away from open water habitats. The wood frog and four species of mole salamanders, for instance, breed only in temporary vernal pools and spend their lives on or beneath the forest floor, but may require vegetated riparian areas to disperse to new territory.

Naturally vegetated riparian areas are just as vital for the state's resident reptile species. Individuals of several species, including the musk turtle, snapping turtle, painted turtle and northern water snake may spend their entire lives in riverine habitats. Other species, such as the Blanding's turtle, spotted turtle, diamondback terrapin and ribbon snake, inhabit wetlands which are often associated with river systems. All turtles lay eggs and, hence, even the most aquatic species require upland habitat for their nesting activities. Corridor protection is especially important for our semi-aquatic wood turtle and the rarest reptile in the state -- the bog turtle. The wood turtle spends much of its life in brooks and streams, but it inhabits surrounding upland habitats during the warmer

months of the year. The three known bog turtle populations appear to require alkaline fens containing rivulets.

Reptiles and amphibians (known collectively as "herps") are far less mobile than birds and mammals. While the latter groups can cross developed areas and recolonize lost ground, often in a matter of years, range expansion by herp species is more likely to be measured in decades. Unbroken corridors, especially riparian corridors of natural habitat, are required to ensure the continued health and expansion of our herp species, particularly the amphibians, as well as small mammals such as shrews and moles. These animals may be unable to cross even moderately sized areas of unsuitable habitat (such as parking lots).

Rare and Endangered Species: Rivers provide critical habitat for many of the state's rare and endangered species. Massachusetts' rivers provide vital habitat for globally endangered freshwater mussels, many rare dragonflies, endangered tiger beetles, Blanding's turtles, Britton's violet and river bulrush. State-threatened bird species such as the least bittern, king rail, pied-billed grebe and the federally threatened bald eagle also inhabit river corridors in the state. Some types of riverine habitats that the Commonwealth's rare species depend upon are floodplain forests, river sandbars, claybanks, freshwater tidal marshes and extensive marshes dominated by emergent vegetation.

What alterations to riparian areas may impair their ability to function as wildlife habitat?

Alterations to the riparian area that are likely to cause the most adverse impact from a wildlife perspective are those that degrade or eliminate an area's functionality as habitat (e.g. replacing vegetated areas with pavement) and/or interfere with its connectivity function (e.g., establishing a barrier to wildlife movement to and/or along a stream corridor). Development in Massachusetts has encroached on river and stream corridors in many areas, fragmenting wildlife habitat and leading to a serious decline in the quantity and quality of wildlife habitat in these areas. It is crucial that we save the linkages that are still intact, as well as taking advantage of opportunities to restore connectivity through the removal of barriers and the reestablishment of vegetative cover on previously devegetated riparian areas wherever possible.

Lawns and Golf Courses

The replacement of naturally vegetated riparian areas with manicured and/or highly managed landscapes such as lawns and golf courses has at least three adverse impacts on wildlife. First, such manicured areas typically require periodic and substantial application of pesticides, herbicides, fungicides, fertilizers and other chemicals that often cause direct harm to wildlife through ingestion or bioaccumulation through the food chain, or lead to habitat-degrading pollution in adjoining water bodies. Second, the vegetation in manicured landscapes typically contains less species diversity than wild areas, usually reducing the diversity and overall abundance of wildlife using such areas. Third, the instinct to keep such manicured areas "neat and tidy" often results in the removal of dead standing or fallen trees, leaves and brush, all of which provide important food or shelter for a wide variety of riparian wildlife. To the extent that such "tidying up" involves the use of mechanized equipment such as power mowers, chain saws, leaf blowers and the like, such devices can further discourage wildlife from using the area.

Roads and Driveways

The placement of new roads and driveways located within riparian areas can also result in serious fragmentation and degradation of wildlife habitat. Generally speaking, the wider the road, the closer it is located to the river, and the greater the number and speed of vehicles using the road, the greater the adverse impact. The first impact, the removal of trees and other vegetation and subsequent regrading of the road right-of-way, typically destroys whatever habitat existed within that area beforehand. Automobile fluids, deicing chemicals and other toxics washing off roadways can pollute adjacent areas and degrade their value as wildlife habitat. Another serious impact is that roads act as a barrier to many forms of wildlife movement. Even relatively narrow rural roads can be a significant obstacle to the movement of sensitive amphibian species. Stormwater catch basins are insidious amphibian traps. Granite curbs along roadways can be enough of a barrier to effectively prevent amphibians and some turtles from safely crossing a road. Fatal collisions of wildlife attempting to cross roadways with motorized vehicles (i.e., roadkill) is a significant cause of death for many of the state's wildlife species, large and small. Such an "impact" may extend beyond the death of the animal struck and affect mates and offspring.

New Homes, Yards and Pets

The placement of new homes within the riparian area can pose an additional set of problems for wildlife. In addition to the impacts associated with roads, driveways and manicured landscapes discussed above, homes with pets and/or other domesticated animals can lead to further degradation or loss of wildlife habitat and even death of wild animals. The clearing of forest or other natural vegetation within the riparian area to establish paddocks for horses, sheep and other grazing animals degrades the utility of that area for native species. Other adverse impacts of pets may extend beyond the houselot to affect riparian areas at a considerable distance. Dogs allowed to roam frequently cannot resist the temptation to chase after deer and other animals. The resulting increased stress on these wild animals can significantly impair their ability to care for themselves and their families. Wildlife will often simply avoid areas with high dog activity, thereby losing what might be otherwise suitable habitat. Last but not least, house

cats allowed to go outdoors are known to be exceptionally destructive to wildlife, especially nestling birds and wild small mammals.

Flood Control Structures

Other alterations that have the potential to cause an adverse impact on wildlife habitat within the riparian area include structural flood controls such as retaining walls, levees and the like, which can isolate a river from its floodplain and serve as a barrier to the very floodwaters that create and maintain floodplain wildlife habitat, considered by many wildlife biologists to be of especially high ecological value.

Why are vegetated riparian areas along smaller streams as significant for wildlife habitat as along the larger rivers?

Wildlife use of riparian areas along smaller brooks and streams, although somewhat different in character from the major rivers, is still quite extensive. Many species utilize vegetated riparian areas during all or part of their life cycle regardless of the size of the adjacent watercourse. In fact, several sensitive species in Massachusetts (e.g., the spring salamander) thrive only in cold, unpolluted springs and small streams. Last but not least, as most of the major river corridors in Massachusetts have already been extensively developed, the areas which remain in a relatively pristine condition (and as such are likely to have the best quality wildlife habitat) tend to be located on the smaller tributaries.

What are some best management practices for riparian areas to maintain and enhance their function as wildlife habitat?

The best way to protect wildlife habitat functions within the riparian area is to maintain and/or restore as much of it as possible in an undisturbed, naturally vegetated state. Many studies have shown the superiority of natural vegetation over cropland and other heavily managed landscapes for wildlife diversity and productivity. These studies have also found that, in general, much larger streamside forest buffer widths are needed for wildlife habitat purposes than for water quality purposes. In fact, 300 feet is the generally accepted **minimum** width needed to provide adequate habitat and movement corridors for most wildlife species. For example, surveys of songbird use of riparian areas recommend that riparian forests be at least 100 meters (330 feet) wide to provide suitable nesting habitat for neotropical migrant birds.

Where some alteration within a riparian area is unavoidable, it should be designed and implemented in a manner that minimizes any loss of connectivity with adjacent vegetated lands as well as any loss of function within the site itself. In general, the further away the proposed work is from the river, the smaller the adverse impact on wildlife habitat and movement. In addition, natural features within a riparian area that may be of particular value to wildlife should be identified and safeguarded from disturbance if at all possible. Such natural features include: **large dead standing trees** (used by hawks and eagles for nesting and roosting); **large trees with cavities** (used by nesting owls, wood ducks, hooded mergansers and other animals); **large dying trees** (bats roost under the loose bark); **stone walls and rock piles** (used by snakes and small mammals); **floodplain and other seasonal pools and water-holding depressions** (used by amphibians for breeding), **as well as adjacent uplands**; **understory tangles** (used as cover by many wildlife species); **large woody debris in streams** (provides basking areas for turtles and snakes); **streambank burrows** (where the homes of weasels, otters and muskrats are typically located); **sandy soils with good sun exposure** (used by turtles as nesting areas); **large trees overhanging the river** (flycatchers, kingfishers, osprey, and other birds use them for feeding perches); **large stands of conifer trees** (often used by deer as wintering areas); **hollow trees and logs** (suitable as dens for some mammal species) and **fallen shaded logs** (preferred by some salamanders for habitat). If stream crossings are unavoidable, road widths should be kept to the minimum possible. In addition, bridges are generally preferred over culverts for stream crossings, as they present less of a potential barrier to fish and wildlife. [For more info about fish- and wildlife-friendly stream crossing standards and designs, go to <http://www.mass.gov/eea/agencies/dfg/der/publications>.]

Last but not least, previously disturbed riparian areas that continue to remain in a degraded condition may present opportunities for restoring wildlife habitat functions. For example, any work that removes pavement or lawn at the water's edge and replaces them with a vegetated buffer of native trees and shrubs is likely to benefit wildlife as well as fisheries and the other functions of riparian areas. Local conservation commissions, the state's Division of Ecological Restoration and Division of Fisheries and Wildlife, watershed associations and land trusts have some expertise in this area, and may provide some guidance on designing effective riparian wildlife habitat restoration measures.

