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River Voices

Riparian Buffers

Riparian Buffers

Rationale, Strategies, and Resources for Restoring and Protecting Streamside Corridors

by Sarah Faulkner Leff

Most river conservation organizations are public advocates, activists, educators, grassroots organizers, and actual, on-the-ground river protectors.

Yet, if we were forced to select the one, most effective way to protect our rivers it would be to preserve natural riparian buffers. Simply put, buffers are the most efficient and cost-effective river protection mechanism existing.

What is a riparian buffer? It is the land next to a river or stream. In its natural state it has native plants growing on it: trees, shrubs, or tall, coarse grasses; the type of vegetation depends on the climate. As the name suggests, these plants "buffer" the stream from anything that might flow into it — polluted water, eroding soil, or toxic chemicals. The roots of the plants hold the river banks in place, stabilizing the land and absorbing the water and materials that flow across the land. Also known as "riparian areas," buffers support both land and water based animals, insects and plants, and are essential in the interrelated web of our natural world.

The width of buffers is important. Depending on the specific characteristics of a stream and its surrounding areas, the size of buffers can and will vary significantly. Though even a small buffer (i.e. 25 feet) is better than none, the larger the protected area, the more likely it will substantially reduce polluted runoff, provide an effective corridor for wildlife, support fish habitat, and ensure many of the ecological functions of the stream. On highly permeable soils or very steep slopes, buffers should exceed 100 horizontal feet.

Buffers can take many forms and serve their functions in rural, suburban, and urban areas alike. A greenway along a river, which typically includes a recreational path and sometimes includes paving, can provide some of the functions of buffers by trapping materials that otherwise might flow directly into a stream. Urban greenways and buffers fill critical roles in this way by retaining materials from entering watercourses. In developed areas, even narrow bands of vegetation can make significant improvements in water quality, habitat, and the environmental health of a river. Urban buffers are especially effective when coupled with pollution and flooding control technologies, such as catch-basin filters, separated storm water/sewer lines, and velocity reduction structures. Further, urban greenways and buffers bring a welcome natural character to developed settings, improving the quality of life and scenic nature in an urban area. To be most effective, such buffers should include native vegetation and be as wide as possible. *(continued on page 4)*

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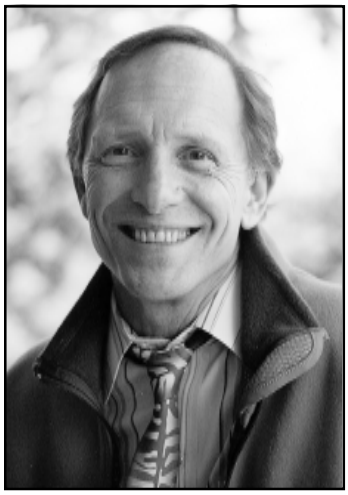
River Network is a national nonprofit organization whose mission is to help people organize to protect and restore rivers and watersheds.

We support river and watershed advocates at the local, state and regional levels, help them build effective organizations, and promote our working together to build a nationwide movement for rivers and watersheds.

River Network also acquires and conserves riverlands that are critical to the services that rivers perform for human communities: drinking water supply, floodplain management, fish and wildlife habitat, recreation and open space.

From the President

"To protect the river, protect the mountains," said Chinese Emperor Yu about 3,600 years ago.



© photo by Linda Kliewer

That is a lesson we have to keep re-learning: to adequately protect any piece of an ecosystem, we have to keep the context of the whole system in mind. Ultimately our obligation as stewards extends to the entire planet.

Still, you have to start somewhere. Protection efforts may start with the most endangered, the most sensitive, the keystone or headwaters areas on which whole systems may depend. Or, we may start in our own back yard and work outward from there.

The land next to rivers tends to be ecologically dynamic and rich, and favored by many life forms, including humans. We like to use rich floodplain soils for agriculture and the rivers themselves as convenient watering places for stock or sources for irrigation. We like to site our factories by rivers since they are so useful as disposal systems and, when large enough, for transportation. We like to site our homes by rivers too. We just love rivers, and sometimes we love them to death.

The land next to rivers tends to be ecologically dynamic and rich, and favored by many life forms, including humans.

The Riverlands Conservancy is River Network's program aimed directly at protecting river corridors and riparian lands. In the long run, the only guarantee of watershed and river health lies in the dedication of the people who live near the river and use it. But sometimes there is no long run. Threats can materialize as rapidly as a "For Sale" sign can be pounded into the ground, or an application for a factory processed. When the threat is immediate, so must be the response.

Through Riverlands Conservancy, we seek out endangered river corridors and protect them by buying them. Usually, we will find an appropriate public agency to transfer these lands to, but now we are beginning to seek relationships with individuals who are willing to buy such lands and protect them through a conservation easement or similar means. Most of our acquisitions in the past have been in the Pacific Northwest, simply because that is where our staff is located, and successful property acquisition work demands that you be on the spot.

Recently, however, we have established an office in Helena, Montana, because there is so much opportunity to protect river corridors in the Northern Rockies. We are already working on some spectacular properties there, which we hope to be able to report on by the end of the year. In coming years we hope to extend our Riverlands Conservancy work to other parts of the country as well. Unfortunately, there remains great need for short term actions to bolster the essential, long-term work of watershed protectors.

Every piece of riparian land protected, no matter how small, can have an enormous impact on the overall health of the river system. We hope this issue will provide you with the necessary information and resources to begin—or continue—working on the establishment and conservation of riparian lands on your river.

Sincerely,

Ken Margolis
President

Riparian Buffers

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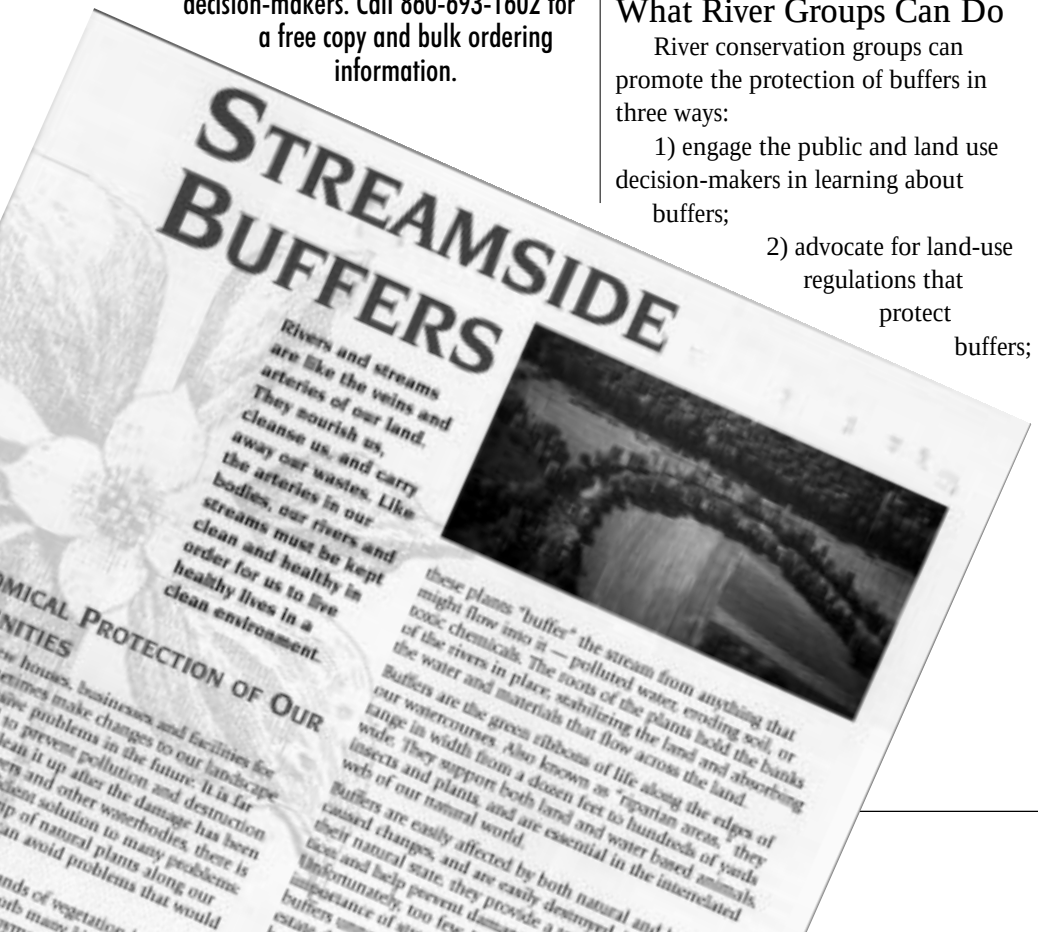
Unfortunately, too few people understand the importance of riparian buffers. Many people destroy buffers unnecessarily through lack of knowledge. Real estate developers clear plants for better views; road builders bury buffers beneath highways; engineers construct culverts, stream channels, and retaining walls over buffers; farmers often cultivate down to the river bank; and homeowners and timber harvesters clear trees right to the water line.

To be most effective, buffers should include native vegetation and be as wide as possible.

Destroying buffers causes erosion, siltation of riverbeds, downstream flooding, increased pollution, damage to fisheries and recreation, species and diversity loss, and reduction of scenic value. Repairing such damage can be extremely costly — often at public expense. The simplest, lowest-cost, most efficient solution to many of these problems is to simply leave a strip of undisturbed natural areas along our rivers and streams. *It is far more economical to prevent pollution and destruction of a river than to clean it up after the damage has been done.*

The Rivers Alliance of Connecticut has published a short, full-color brochure entitled *Streamside Buffers*. Written for the lay person, the brochure describes the benefits of protecting natural streamside vegetation for landowners and land-use decision-makers. Call 860-693-1602 for a free copy and bulk ordering information.


STREAMSIDE BUFFERS

Rivers and streams are like the veins and arteries of our land. They nourish us, cleanse us, and carry away our wastes. Like the arteries in our bodies, our rivers and streams must be kept clean and healthy in order for us to live healthy lives in a clean environment.

What River Groups Can Do

River conservation groups can promote the protection of buffers in three ways:

1) engage the public and land use decision-makers in learning about buffers;

2) advocate for land-use regulations that protect buffers;

3) encourage permanent protection through purchase of buffer land in fee or easement, by public agencies or private land trusts;

(4) on-the-ground restoration.

1) Engage the public and decision-makers in learning about buffers

River groups can work with communities, landowners, the media and state, local and federal decision-makers to increase the understanding of the value of buffers and how to protect or restore them. Publications and fact sheets, workshops, and articles in newspapers and periodicals all help residents and lawmakers learn about the importance of streamside vegetation. Volunteer streamwalks, riverside cleanups, float trips, and native plant restoration projects can raise awareness and involvement in the need for river protection and the role of buffers.

The Rivers Alliance of Connecticut has found that use-specific, targeted information is most useful to help inform land owners about the importance of buffers. For example, a fact sheet written for farmers that addresses the importance of buffers in agriculture, including land use guidelines for farming, is better received than a general buffers fact sheet. Similarly, a fact sheet aimed at corporate office parks, addressing the role of buffers in good stewardship, lawn maintenance and municipal responsibility, is more effective than a general brochure. When such documents can address the specific concerns of those land owners, such as loss of productive acreage versus the solubility of nitrogen fertilizers, the information is much more meaningful and more likely to result in buffer protection.

2) Public Education and Passing Laws

Since the case to protect buffers is so compelling, it is easy to gravitate toward

mandatory legal requirements that consistently protect buffers. A number of states have buffer or set-back requirements to protect riparian areas. Other states have enabling laws that allow counties or towns to regulate buffers around wetlands, watercourses, and waterbodies. Where such laws exist, river groups should promote their use and enforcement, and defend their existence.

Many states have passed laws that, while not requiring buffers on a state-wide level, allow local communities to adopt regulated area or set-back areas along watercourses. River groups can work effectively at the community level to encourage adoption of these buffer areas, including educating local land-use officials about the importance of buffers. Such local, personal contact can result in substantial improvements in the regulation of stream-side lands.

In states without buffer laws, river groups should assess the feasibility of passing state, regional or local buffer protection legislation. Before taking on this challenge, consider the legislative climate, potential allies and opponents, the research, information, and public education work that will be needed, and whether your own resources are adequate to complete the task.

In explaining why we need buffers, make sure to emphasize their economic benefits

In Connecticut, the river groups experienced the difficulty in passing buffer laws at the state level. The state's Rivers Advisory Committee, river groups, and the Department of Environmental Protection worked for four years to research and draft a bill that would have required a 100-foot buffer area along most rivers and streams. Despite the widespread participation in developing the bill, the legislature killed the bill upon introduction. A similar but less stringent bill passed in Massachusetts after years of intensive lobbying.

Strong opposition to mandatory protected buffers arises out of the controversy over regulating private land use. Interest groups including agriculture and home builders may strongly oppose mandatory buffers. Some strategies to overcome these challenges are to:

• Garner support from groups that will benefit from buffers, including angling and boating groups, commercial fishermen, public water utilities, dam owners, tourism bureaus and businesses needing clean water, local landowners and others;

• Educate lawmakers and the public on the essential, economic link between retaining buffers and avoiding costly clean-ups later on. Emphasize the economic benefits of clean rivers, scenic streams, recreational opportunities, and tourism.

• Educate landowners, lawmakers, and concerned organizations about the critical importance of buffers in public safety and environmental health; and

• Clarify what the proposed bill does and does not do.

It is important to carefully research and design a buffer program that is appropriate for individual states. What works in West Virginia may not work in Florida or Iowa. Bills should be designed to address the concerns of groups including agriculture, industry, residential owners, utilities, realtors, home builders, and land owner associations.

Brian Richter, courtesy of The Nature Conservancy

With less need to clean and filter public drinking water, riparian buffers lower consumers' water rates. Maui Stream, Hawaii

In explaining why we need buffers, make sure to emphasize their economic benefits.

• Restoring and protecting buffers today will result in cheaper clean-ups tomorrow.

• Buffers are an important component in the "quality of life" that draws tourists, business, and residents into an area.

• Buffers reduce costs to industries that need clean water.

• With less need to clean and filter public drinking water, buffers lower water rates; and much, much more.

With buffers, our rivers can be universal economic assets.

3) Encourage Permanent Protection Through Land Purchase

Regulatory protection of buffers is an important tool, but regulations can

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Riparian Buffers

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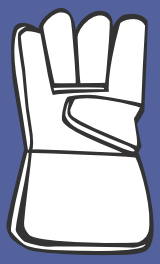
change with the political winds, and lack of enforcement is a constant issue. Permanent protection of natural areas is another important tool. Working with local communities, private land trusts, state and federal agencies, and others, we must continue to encourage permanent protection of riparian buffers. Through outright acquisition, easements, and leases, long-term protection offers the best future for rivers.

4) On-the-ground Restoration.

One of the most immediate ways you can work toward restoring a buffer is by offering to do the work yourself. If you have the resources and human power to inventory the intactness of the riparian corridor, prioritize the "hot spots" (i.e. degraded areas), and identify the owners of those areas, consider organizing a riparian restoration project. Develop an agreement with the landowner(s) and organize a field day or weekend to fix the problems. Dig holes, plant vegetation and stabilize banks. Seek technical advice and support from your local district conservationist for the National Resource Conservation Service.



One of the most immediate ways you can work toward restoring a buffer is by offering to do the work yourself.

Helping Each Other over the Hurdles

It is ironic that protecting buffers is both the most important and most threatening effort in river conservation. Although buffers offer the least expensive, easiest to implement, most environmentally responsible, and most attractive option for improving our watercourses, they are the most difficult to achieve. The American love-affair with private rights and home-rule makes many people blind to the advantages offered by buffers, causing fear and opposition. Perhaps buffers' lack of complexity, technical innovation, and expense work to their detriment: our society distrusts Mother Nature. As we, the national river community, work toward riparian buffer protection, we should share our successes and failures so as to help each other over familiar hurdles of public misinformation and distrust. Together, we must find a way to convey to the public that buffers offer something unique: instead of expensive clean-up projects and government programs, we can make enormous improvements in our own water quality and lives by simply leaving well enough alone.

Sarah Faulkner Leff is the executive director of the Rivers Alliance of Connecticut.

Success Story: South Fork Donner and Blitzen River

photos courtesy of BLM Burns District Office, Oregon

The riparian conditions in 1979 reflect annual, uncontrolled, season-long livestock grazing. By 1995 improved livestock management was implemented in cooperation with the permittee, Rooing Springs Ranch, who is also the neighboring private land owner. Conservation of wilderness values has limited the opportunity for livestock herding, periodic rest, and restricted season of use, are strategies which resulted in dramatic riparian habitat recovery.

What is a Buffer?

by River Network Staff

Sarah Lauterbach

Buffer \'b ə-f ər\

n: someone or something that protects or shields (as from physical damage)

The term "buffer" means different things to different people. For some, it means a riverside area, managed by humans, that shields the waterbody from particular impacts caused by adjoing land use. For others, it means any permanent streamside vegetation, either natural or managed, voluntarily protected or legally required, that helps protect the natural functions of the river. Natural stream-side forests, other types of naturally occurring vegetation, managed grassy filter strips, building set-back areas, wind-breaks, field borders, and wildlife corridors are just some of the types of areas that fall within various definitions of "buffer". River guardians frequently ask "How big should buffers in my watershed be?" Idealists among us answer "The bigger the better, so as big as you can possibly fight for and get!" Scientists answer "As big as necessary, given the characteristics of your particular watershed, to protect water quality, habitat value, and ecological functions." Pragmatists answer "as big as you can get, given the realities of local land uses, attitudes, economics, and politics." This is enough to make you yearn for a definitive answer. Alas, there isn't one. We believe you need two things - information and inspiration - to answer the question well in your place and time. With this issue of *River Voices*, we've strived to give you plenty of each. We hope you will find this information useful as you work to secure the buffers your rivers and streams need.

Ecological Functions & Services of Riparian Buffers

Ecological Functions

Buffers and natural riparian zones provide communities with numerous benefits, free of charge:

Reducing Water Pollution

Non-point source pollution is responsible for most water pollution in the United States today. Oils, salt, and sand from our roads; fertilizers used on lawns and farms; manure from livestock and other pollution can damage our rivers' health. The most efficient and cost-effective way to keep these pollutants out of our water is to "trap" them by maintaining a buffer of natural plants along our streams and rivers to absorb and filter pollutants before they enter the water. Buffers even appear to remove some pollutants from water flowing down a stream's main-stem.

Reducing Flooding and Drought

During floods, undeveloped land surrounding rivers acts like a sponge, absorbing rising and falling water. Native plants in undisturbed areas help slow flood velocity, store water for future use, and slowly release water over a long period of time. Loss of floodplains and natural stream buffers increases the chance of floods and can worsen flooding when it occurs. Intact buffers also store subsurface water and slowly release it to the stream channels, maintaining baseflow during dry spells.

Controlling and Reducing Erosion

Erosion results in serious environmental and economic damage. Loss of topsoil damages farms, homes, and businesses, chokes clean streams, destroys fish and animal habitat, and eventually clogs our harbors and shellfish beds in bays and estuaries. Much erosion can be controlled by keeping a buffer of natural plants along the banks of our streams and rivers to "trap" eroding soil, strengthen and stabilize stream banks, and help keep the water clean. Additionally, leaves, both living on trees and dead on the ground, protect streamside soil from splash erosion (i.e., the scattering of topsoil by raindrops as they hit the ground).

Fish Habitat

Fish need clean water, minimal variation in water temperature, food and shelter. Buffers create and maintain fish habitat. Shade from streamside vegetation reduces water temperature variation. Plant detritus falling into the water provides hiding and breeding places. Leaves provide food for aquatic insects, the base of the food chain for fish and other animals.

Providing Nutrients

Buffers supply up to 90% of the nutrients, in the form of shed leaves and fallen insects, for instream animals.

Animal Habitat and Migration

Riparian buffers are essential to feed, shelter, and provide travel paths to more than 95% of all terrestrial species in North America. Further, buffers are essential in the breeding and nesting cycles of many species. Loss of natural buffers limits animals' safe access to water, putting more and more species at risk.

Ecological Services

The above natural functions can be restated anthropocentrically into three categories of ecological services, i.e., natural processes that sustain human life:

Economic Services

Reducing downstream flooding
Recharging aquifers
Supplying surface water in arid regions
Supporting the productivity of fishes and other harvestable species
Supporting sustainable yields of timber
Fueling the recreational and tourism industry

Social Services

Storing heavy metals and toxins
Improving air quality
Serving as natural fences, visual screens, and noise buffers
Recycling nutrients
Improving the quality of drinking water sources
Serving as sinks for our excess carbon dioxide
Storing excess sediments
Fulfilling recreation and aesthetic needs
Serving as laboratories for teaching and research
Offering places for camping, nature study, and hunting

Biological Services

Providing special habitats for rare and upland species
Serving as corridors for species movements
Supporting predators of rodent and insect pests

Ecology of Natural Riparia

by George Constantz

photo courtesy of Oregon Natural Resources Council

A destroyed riparian ecosystem.

The last thing I did before accepting this new job at River Network, and the first thing I did after I accepted this writing assignment, was to bike down to my favorite eastern stream, the Cacapon River, hike into its riparium, plunk down on an old favorite log, and begin to reconnect.

One of my favorite places to sit and think about how rivers work is an intact riparium. Shifting sunflecks, the organic smell of humus, smooth scars on the upstream sides of sycamores, the distant rattling of a belted kingfisher, and yes, even that occasional Bud Lite can. Why am I drawn here when I need to figure things out?

Natural Riparia

A riparium is the entire riverside ecosystem, including the soil, plants, and animals, that are influenced by the nearby river. Riparian ecosystems consist of nonliving parts such as groundwater, rocks, and soil; ground cover, understory, and canopy plants; and animals such as insects, reptiles, birds, and mammals. Some ecologists define the riparian zone as extending laterally to the limits of flooding.

Intact riparia are often the most ecologically productive and biologically diverse areas in a region. Organisms and nutrients are moving back and forth between aquatic and upland areas, water levels are fluctuating, the channel is shifting laterally, and the riparian vegetation is many-layered. This complex, dynamic environment sustains a large variety of species, life history patterns, and nutrient cycles.

Riparia are interdependent with the river's mainstem and adjacent uplands. A western riparian bird provides a prime example. The dipper feeds underwater on the juvenile stages of insects (e.g., dragonflies, damselflies, caddisflies) that in turn were nourished by leaves shed by riparian plants.

Riparia vary naturally across the continent. In central Appalachia, the Cacapon River's riparian ground cover includes grasses, Virginia bluebell, and ferns; paw paw, dogwood, and black willow are sprinkled through the understory; and the canopy is dominated by tulip poplar, sycamore, and river birch.

In arid central Oregon, an early explorer reported that the Crooked River was well wooded with willows and aspen. In the desert Southwest, cottonwood and willow riparian forests relied on 10-year floods to scour shrubs and saplings, deposit layers of fertile sediment, distribute seeds, and stimulate germination. In the Great Plains, lush riparian poplar forests rained small wind-dispersed seeds in the spring, when natural flooding occurred. As you can tell by my use of past tense, these processes are rarer nowadays due to dams, diversions and other human impacts.

As you can see on page 8, riparia sustain a variety of functions. Of those, the functions of assimilating nutrients and providing habitats seem to be universal.

Neutralizing Pollutants

Nitrogen and phosphorus exist naturally and provide nourishment to plants and animals. Plant decomposition, deposition of atmospheric nitrogen, and the erosion of phosphorus-containing rocks, are natural sources of nitrogen and phosphorus. However, nonpoint sources of pollution such as runoff from city streets and farm and crop lands, as well as point sources such as sewage treatment plants, can contribute to excess nutrients in the environment.

In many streams, the availability of nitrogen or phosphorus limits the growth of aquatic plants, sometimes to the point of becoming a stream-choking nuisance. Intact riparia naturally remove nitrogen and phosphorus running off the uplands towards receiving streams.

Nitrogen removal

Because it dissolves readily, nitrogen moves from uplands to receiving streams primarily in the form of nitrate dissolved in groundwater. Ecologists have demonstrated that as groundwater seeps through a riparium on its way to a stream, the concentration of nitrogen decreases.

This drop in groundwater nitrate is caused by two processes. First, some of the nitrogen is absorbed by the roots of metabolically active plants. In well oxygenated surface soils, bacteria and fungi convert nitrogen into nitrate, which is used by bacteria and plants to synthesize proteins. Second, organic material (e.g., leaf litter) from trees, combined with soggy soils, create the anaerobic conditions for bacteria that convert nitrate into nitrogen gas, a process called denitrification. The nitrogen gas then simply rises into the atmosphere.

Even though tree roots pump some nitrogen from greater depths to the surface, most denitrification takes place

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Ecology of Natural Riparia

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in the top layers of soil. Thus, in general, riparian plants remove nitrate from shallow groundwater that passes by their roots. Nitrate reaching deeper groundwater will be carried under the root systems and directly enters streams without having been filtered.

As you can see, all parts of a riparium play a role in nitrogen removal. Because of both assimilation and denitrification, nitrogen retention by one particular riparian forest was 89%, compared to cropland's 8%.

Phosphorus Assimilation

Riparia also remove excess phosphorus from runoff. About 85% of the available phosphorus is adsorbed to small soil particles carried in surface flow. The litter, leaves, stems, and other debris in the riparian forest floor slow the runoff's velocity, allow silt to drop out, and the associated phosphorus is then taken up by plants. Phosphorus retention by one particular riparium was 80%.

Even narrow riparia are effective phosphorus filters, particularly when adjacent to cropland. A forested strip as narrow as 50 feet can remove most of the phosphorus from runoff.

Brian Richter, courtesy of The Nature Conservancy

A fully natural and intact riparium on the Yampa River in Colorado.

Habitats

The numbers of animal species and individuals are greater in riparian than upland areas. Many species of animals thrive in intact riparia: alderfly, butterflies, tiger beetles, salamanders, frogs, turtles, snakes, ducks, herons, bald eagle, flycatchers, warblers, mink, river otter, beaver, muskrat, deer, squirrels, cottontail rabbit, to name a few.

In the Great Basin of southeastern Oregon, more than 75% of the terrestrial wildlife species use riparian habitats. In Arizona and New Mexico, 80% of all vertebrate species depend on riparia for at least half their life cycles. Riparia provide habitat for more species of birds than all other western rangeland vegetation types combined. The wider the riparian forest, the greater the number and variety of birds and animals it supports.

Unbroken riparia also form pathways for dispersal and migration of animals. As habitat becomes increasingly fragmented, remaining riparia connect isolated habitat patches, allowing movement of individuals among patches, thereby reducing the odds of inbreeding and species extinction. Riparian zones are also key stop-over sites for migrating birds.

Buffers

As opposed to a fully natural and intact riparium, a man-maintained buffer zone is an area where land uses have been modified to isolate a bothersome activity from a sensitive area. Examples include shade strips, visual barriers, and runoff filter corridors. In the context of streamside areas, there are several kinds of riparian buffers: grass filter strips, old field corridors, mature bottomland forests.

I suggest that the success of any particular riparian buffer can be evaluated by the extent to which it performs the functions and provides the ecological services of a natural riparium. In general, because function follows form, the closer a man-made buffer is to the structure of a natural riparium, the more fully it will provide natural functions and services (see page8).

For example, a mature riparian forest will perform more services than a grass buffer. Grass buffers are not as effective at removing nitrogen because they (a) create less organic matter to fuel the denitrification process and (b) lack the roots to pump as much nitrate from groundwater. Grass is also less effective for controlling surface runoff because heavy storms can cover the grass with mud and allow water to flow unfiltered to the stream.

Recommendation

All these technical ideas lead me to offer a scientifically proven strategy for creating and maintaining riparian buffers: stay out.

Let me rephrase that a little less glibly. To restore a buffer, reduce degrading land uses and allow natural succession to restore the riparium. To maintain an existing buffer, avoid any new degrading land uses.

Conclusion

Now that you understand some of the ecological reasons why riparia are complex, dynamic, and crucial protectors of your river, you'll appreciate them even more.

A recent survey showed that the most desirable features of primitive areas (e.g., mature trees, streamside trails) are nearly always present in healthy riparia. So maybe my need for riparian pondering might make some kind of primordial, evolutionary sense after all.

Dr. George Constantz is a watershed program manager for River Network.

Guidelines for Gathering and Mapping Data for River Corridor Lands

by Russell Cohen and Maria Van Dusen

For watershed associations, land trusts and others concerned about river protection, gathering information about the location and ownership of land parcels within river corridors is crucially important. Besides the obvious value of knowing whom to contact about the protection of specific parcels, assembling data on riverine landowners assists communication with private citizens whose activities affect the river's condition and appearance.

Riparian landowners are often the best sources of information about the river. Resident and/or business landowners can be important observers on behalf of the watershed association, reporting incidents of illegal dumping, unusual wildlife sightings, land uses contributing to nonpoint source pollution, and other valuable information. Owners of riverfront property are great volunteers for river and watershed projects, and are frequently among the most generous financial supporters of river groups.

It therefore makes great sense for groups to get to know riparian landowners. Through receiving copies of the organization's newsletter and invitations to events on and about the river, landowners become familiar with the organization's mission and activities, increasing the likelihood they will cooperate with land protection activities along the river. A great way to involve landowners, for example, is a "Landowners' Perspective" column in your organization's newsletter, written by one or more riparian landowners who support your cause.

First, however, you need to know who owns land along your river, and how to reach them. You'll also need to know the location and dimensions of the parcels in order to determine protection priorities and identify linkage opportunities. This article explains how and where land ownership data is recorded and how to transcribe such data to maximize its value.

How to gather and map information about river corridor land parcels

You'll first need to determine the portions of the river corridor for which you need information. Determine what cities or counties govern land within this corridor. Prepare a "base map" showing the river and the lands around it. You'll need to find the tax assessor's office for each city or county through which your river runs. You are looking for land ownership data in property tax records and maps. Sometimes city or county planning offices also have maps showing land parcels. Explain that you're doing property ownership research along the river, and that you'd like to get access to a set of assessors' maps. To save effort and expense, determine early on which maps are needed for your project area.

Most assessors' offices keep a series of "plat book" maps (sometimes as many as 100) showing the location and dimensions of all parcels of land within the town or county. Because their primary purpose is tracking land ownership for property tax assessments, the accuracy of these maps, especially the location of natural features such as rivers, should not be taken for granted. The maps may be keyed to an ownership list and cross-referenced by map and parcel number. Numbering and bookkeeping systems often vary, so ask for an explanation if the system is unfamiliar to you.

Assessors' maps are available for public inspection, tracing, and sometimes for photocopying or purchase. Copies on transparent or translucent material are the most useful. Accessibility varies from town to town. Some towns will photocopy assessors' maps or portions of maps for a fee if requested. Unless your project area is small, it will take many hours to transcribe the information if you can't obtain photocopies or purchase the maps you need. In any case, it is best to call the assessor's office in advance, to arrange review or pickup of the maps. The assessor's office can advise you on the best approach.

Putting the assessor's map info onto the base map

Your project area's base map will be greatly enhanced by including parcel boundary lines and parcel number information from the assessor's maps. The biggest obstacle is that assessor's maps are almost always at a different scale than your base map. If the scale isn't evident from the maps, be sure to find out before you leave the assessor's office.

There are two main methods for transferring information from the assessor's maps to the base map while reconciling any scale difference. If the assessor's office will sell you transparent or translucent copies of the maps (or staff can set you up in a quiet, dark room where you can borrow the assessor's map books temporarily), and you have access to a suitable projector, the "projection" method is probably the fastest and most efficient. Tape the base map to a wall and use an overhead, opaque or other suitable projector to project the assessor's maps on top of the base map. Move the projector back and forth until the scale of the projection matches that of the base map. Use

(continued on page 12)

Guidelines for Gathering and Mapping…

continued from page 11

Brian Richter, courtesy of The Nature Conservancy

Good maps can help you be more effective in saving your river and watershed.

features common to both maps such as legend scales or roads to do this. Then, trace the projected parcel boundary lines onto the base map (don't forget to transcribe the parcel numbers too).

An alternative means is to copy, trace or sketch from the appropriate assessor's map the shape, configuration, and location of each parcel and shrink them via photocopying to the same scale as the base map; then fit together each parcel at the appropriate places on the base map.

If you must transcribe at the assessor's office or at home, don't despair! Patience and persistence will carry you through. Use an engineering ruler with inches divided in tenths for simplicity. Mechanical drawing dividers[?] can also be useful. A compass can be used for angles. As you work, keep checking to see if your sketch makes sense — watch for road or stream crossings as reference points and keep in mind the relative size of each parcel compared to others. Use the relative lengths of property lines to verify measurements. Verify direction of boundary lines using whatever landmarks are available such as road or stream junctions.

Ownership information and property information sheets

The assessor's office should also keep property tax records, cross-referenced by parcel number, listing details such as ownership and assessed value for each parcel. Some offices will sell you copies of assessor's records or provide a computer disk for a fee.

Once you've located the property tax rolls corresponding to the assessor's maps covering your project area, you'll need to obtain copies or transcribe information from the tax records. Bear in mind that whatever information you neglect to copy today will surely be needed next week. If copies are not available or are too expensive, transcribe the full name and address of all owners of record, property address, acreage, assessed value for land and any buildings, date of acquisition, book and page reference and any other information. If possible, note whether an owner has additional land outside the project area. Don't forget to record the date the information was collected and/or transcribed to the data sheets and maps.

Reading between the lines: how to deduce additional information about landowner and parcels

You may be able to infer additional clues about riparian landowners and their properties from the information provided in the assessor's records. Such clues are often helpful in shaping protection strategies (e.g., figuring out which landowners to approach first). Some examples follow.

• *Name of owner(s)*. Establishing initial contact with landowners is among the most intimidating aspects of land protection. Many groups choose to first approach riverine landowners who they know are sympathetic to their efforts. This enhances chances of early successes for your program, which in turn builds momentum for further land protection.

• *Landowner's mailing address.* Sometimes absentee landowners don't care as much as locals about what happens to the river. They may also be eager to divest themselves of a remote property that is a potential management headache and a property tax burden.

• *Location and/or Access.* Usually assessor's records state how to find and/or obtain access to each parcel, such as a street address, or the name of the street only. Note particularly if a parcel appears to be "landlocked" (i.e., doesn't have any street frontage). The lack of access to streets sometimes means that the parcel is not under imminent threat of development. Lack of access may limit the parcel's market value and enhance its affordability for your group or another conservation purchaser.

• *River frontage (if any)*. You may find a river frontage figure (expressed in feet) provided for you on the tax rolls; if not, you should be able to estimate it from the assessor's map.

• *Transfer date (i.e., the date the property came under its current ownership)*. This information can give you important clues about the landowner's age and familiarity with the river. An owner who took title 50 years ago will have different needs and interests than a new owner.

• *Size of parcel and assessed value (both land and building figures are important).* Assessed value for structures means that the parcel is at least partially developed. If assessed for land only, the parcel may be undeveloped.

• *Special tax classification (if any).* The tax rolls should indicate if a parcel is currently enrolled in a particular program (i.e., Forestry, Agriculture, or Recreational Open Space) as well as the date such enrollment is scheduled to expire. The listed use of the parcel may give clues to the owner's interests and intent.

The next steps

First, look over the data you've already collected. You may already know enough to identify some critical short-term protection priorities, such as the impending subdivision of a large parcel with substantial river frontage. You should then continue to gather land use, resource and other information to go on your project area base map and property information sheets. Most of this additional data will be found outside of the assessor's office, but you should return every year or two to track changes in property ownership and other information.

Russell Cohen has been employed by the Riverways Program of the MA Department of Fisheries, Wildlife and Environmental Law Enforcement since 1988 and has served as its Rivers Advocate since 1992.

Maria Van Dusen has been the coordinator of the Riverways Program within the Department of Fisheries, Wildlife & Environmental Law Enforcement since 1993. She served as coordinator of the state's Adopt-a-Stream program from 1987-1992.

Sample Property Information Sheet

Blackstone River Greenway Project
PROPERTY INFORMATION SHEET

Town: Map: Parcel:

Owner:

Address:

Telephone:

Other Contact:

Registry: Book: Page: Transfer Date:

Assessed Value: Land $ Buildings $ Total $

Taxes $ State class Code Acreage

Location: Access: Square feet:

Bldgs: yes ( ) no ( ) Road frontage: _____ ft.
River frontage _____ ft.

Enrolled in Chapter 61 (_____) tax reduction program? ( ) Until? ____

Zoning

Residential
low density ( )
med. density ( )
high density ( )
Commercial ( )

Industrial

Floodplain ( )

Other ( )

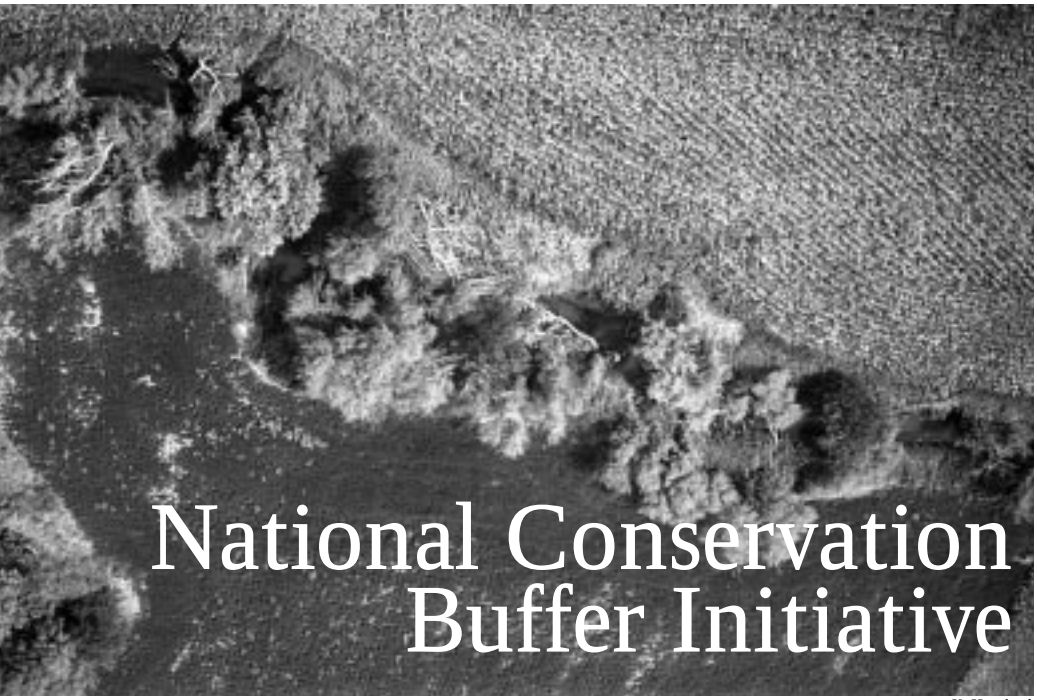
Property Characteristics

Developed ( ) Partially developed ( ) Undeveloped ( )
Protected open space ( )
Town, State, Federal or other public or quasi- public
public land not maintained as open space ( )
Historic significance: structures/grounds, etc. ( )
Rare species ( ) Important wildlife habitat ( )
Details:_____
_____
Scenic Views ( ) Aesthetic value ( )
Good potential canoe launch site ( )
Potential Blackstone Bikeway or other rec. r.o.w. ( )
Other relevant data: _____
_____
_____
Recommended for inclusion in the Greenway: ( )

Appraisal amount: $ Date: Willing seller: ( )

By whom Survey exists? yes ( ) no ( )

This data sheet prepared by: Date:



National Conservation Buffer Initiative

K. Hoagland

by Nancy Mathews

In April 1997, USDA officially launched the new National Conservation Buffer Initiative (NCBI) and pledged to help landowners install 2 million miles of conservation buffers by the year 2002. Agricultural producers and other landowners who install buffers can improve soil, air and water quality; enhance wildlife habitat; restore biodiversity; and create scenic landscapes. Already, just over a year later, more than 200,000 miles of new buffers are in place.

Already, just over a year later, more than 200,000 miles of new buffers are in place.

In concert with other agricultural conservation practices, buffers offer farmers an opportunity to demonstrate their commitment to conservation, their willingness to share responsibility for environmental improvement. Buffers can reduce nonpoint source pollution by limiting erosion and trapping farm fertilizers and other chemicals. A grass filter or buffer near a stream can take up more than 70 percent of nutrients; in some cases the addition of trees will increase that.

The initiative is led by the Natural Resources Conservation Service (NRCS) in cooperation with the Agricultural Research Service, Farm Service Agency; Forest Service; Cooperative State Research, Education, and Extension Service; state conservation agencies; conservation districts; and numerous other public and private partners.

A variety of programs and players are helping to ensure that the goal of the NCBI is achievable. One example is the continuous Conservation Reserve Program (CRP) sign-up under which eligible land may be enrolled at any time in 10- or 15-year contracts to install conservation buffers. Landowners participating in CRP can also receive rental payments based on soil type and local land rental rates. Rates range from $20 or $30 per acre in some marginal farming areas to more than $150 per acre in the highly productive rich-soil areas of the Farmbelt. Up to 50 percent of the cost of installing buffers — site preparation, grading or shaping, seeds, trees, shrubs — is available under the continuous CRP sign-up.

Other programs providing funding and fostering an understanding of buffer benefits include the Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentives Program (WHIP), Wetlands Reserve Program (WRP), and Stewardship Incentive Program (SIP).

This support for NCBI — both financial and technical — is critical because conservation investments are not cheap. For example, a mile of single-strand, high-tensile electric fence to keep cattle out of a stream in Pennsylvania might cost between $2,500 and $5,000. A barnyard water management system on one dairy farm in the Syracuse, New York watershed may cost as much as $150,000. Restoring two miles of badly damaged Ronan Spring creek in western Montana cost nearly $100,000. Numerous jurisdictions are adding extra support for conservation buffers through such schemes as tax incentives and easement acquisition. Illinois law allows for a reduction in property taxes; Virginia and other states are acquiring easements and development rights. Some localities are requiring buffers to improve water quality, enhance wildlife habitat and reduce flood risks: A Louisville and Jefferson County, Kentucky ordinance requires that “a natural vegetation buffer strip shall be preserved at least twenty-five feet on each side of the stream bank as defined by the hydraulic model of the channel.” Napa County, California requires vineyard setbacks.

Improvements may come in small increments, but they can add up to much more than the sum of their (local) parts. Moreover, they pay off — on and beyond the farm or ranch. Riparian

fencing and buffers in Pennsylvania on 3.5 miles of creeks kept 700 dairy cows from tributaries of the Susquehanna River, a Chesapeake Bay tributary; Syracuse is investing up to $10 million over 10 years in on-farm conservation measures to protect its unfiltered Skaneateles Lake water supply — and avoid spending up to $60 million for a filtration plant; buffers installed in eastern Idaho — 900 miles from the ocean — are helping restore native spawning grounds for Pacific salmon.

Landowners are proving highly receptive to the Buffer Initiative's voluntary, incentive-based approach, and nonprofit groups are finding new opportunities to collaborate with private landowners and public agencies. Many nonprofits are contributing to fencing or trees or volunteer labor, working closely with NRCS and other agencies to promote buffers and help get them installed. In one Illinois county, for instance, Pheasants Forever provided more than $27,000 worth of seed for switchgrass cover; a Maryland chapter of Trout Unlimited coordinated with landowners and state and federal agencies to get buffers installed on trout streams; in South Dakota, Ducks Unlimited joined with the U.S. Fish and Wildlife Service and the state Department of Game, Fish and Parks jointly put up half the cost of specialized seeders to plant wildlife-friendly grasses.

To find out more about how you can become involved, contact your local USDA Service Center or visit the Web Site at: www.nhq.nrcs.usda.gov/CCS/Buffers.html

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Nancy Mathews is currently a consultant on the National Conservation Buffer Initiative. She has worked on environmental issues for more than 30 years-for the U.S. Congress and for national and international organizations (Sierra Club, Environmental and Energy Study Institute, UNESCO, OECD).

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Technical Factors for Riparian Buffer Implementation Through Local Ordinances

by Kyle Dreyfuss-Wells and Thomas J. Denbow

Riparian buffers provide flood and erosion control, ground water recharge and purification, nonpoint pollution control and habitat protection. Buffers provide these services to communities at very little cost to taxpayers. While riparian buffers may be established through land purchases and conservation easements, local ordinances are a highly effective method. Ordinances facilitate a uniform approach to riparian protection within a community.

To maximize the services riparian buffers provide, buffer ordinances should be designed with an awareness of their impacts on individual properties; implemented with public support; and maintained through public and private efforts. This article introduces two components in developing a successful riparian buffer program: collection of data to document the functions and benefits of riparian buffers, and technical considerations when drafting a riparian buffer ordinance.

Data Collection

Several options exist for the collection of data to support the need for riparian buffers:

Option 1: Generally Available Data

This may include general technical research, state guidelines and your organization's in-house expertise. Under this option, a community would rely only on this existing information.

Option 2: Generally Available Data and Previously Developed Local Natural Resource Studies

Communities would rely on generally available data and any previous natural resource studies developed by the community.

Option 3: Generally Available Data and New Buffer-Specific Natural Resource Studies

These new studies would include an inventory of a community's natural resources, specifically focused on the establishment of riparian buffers.

As the flow chart on page 17 shows, the level of data collection necessary to design a reasonable riparian buffer ordinance is a community-specific decision. In general, however, the costs to develop a riparian buffer program increase from Option 1 to Option 3. Support for a buffer ordinance, on the other hand, flows in the opposite direction. Option 3 will most likely provide the greatest support. Under Option 3, the riparian buffer ordinance is based on an inventory of the community's riparian areas and the services they perform for the community. The inventory is focused on the riparian buffer program the community is currently considering. As a result, local officials are better prepared to examine the potential effects of the ordinance on individual properties and have documentation of the health and safety benefits to their community.

Technical Considerations

Communities should consider the following technical issues when designing a riparian buffer ordinance.

- Buffer width
- Type of buffer vegetation
- Permitted and prohibited activities and uses
- Long-term buffer management
- Fixed, flexible, or zoned buffers

Buffer Width

In determining the minimum width for a riparian buffer, a community should consider the services it wants the buffer to perform; the slope of the buffer area; the presence of wetlands; and the location of the 100-year floodplain. Research on buffer widths indicates that between 50-150 feet of vegetated riparian area measured from the ordinary high water mark on each side of a river channel is necessary to provide buffer services. Once a community has chosen a minimum width, provisions should be made to increase this minimum to accommodate steep slopes (greater than 12%); wetlands; and the 100-year floodplain. In some cases, the minimum width may need to be reduced to accommodate historic and other nonconforming uses.

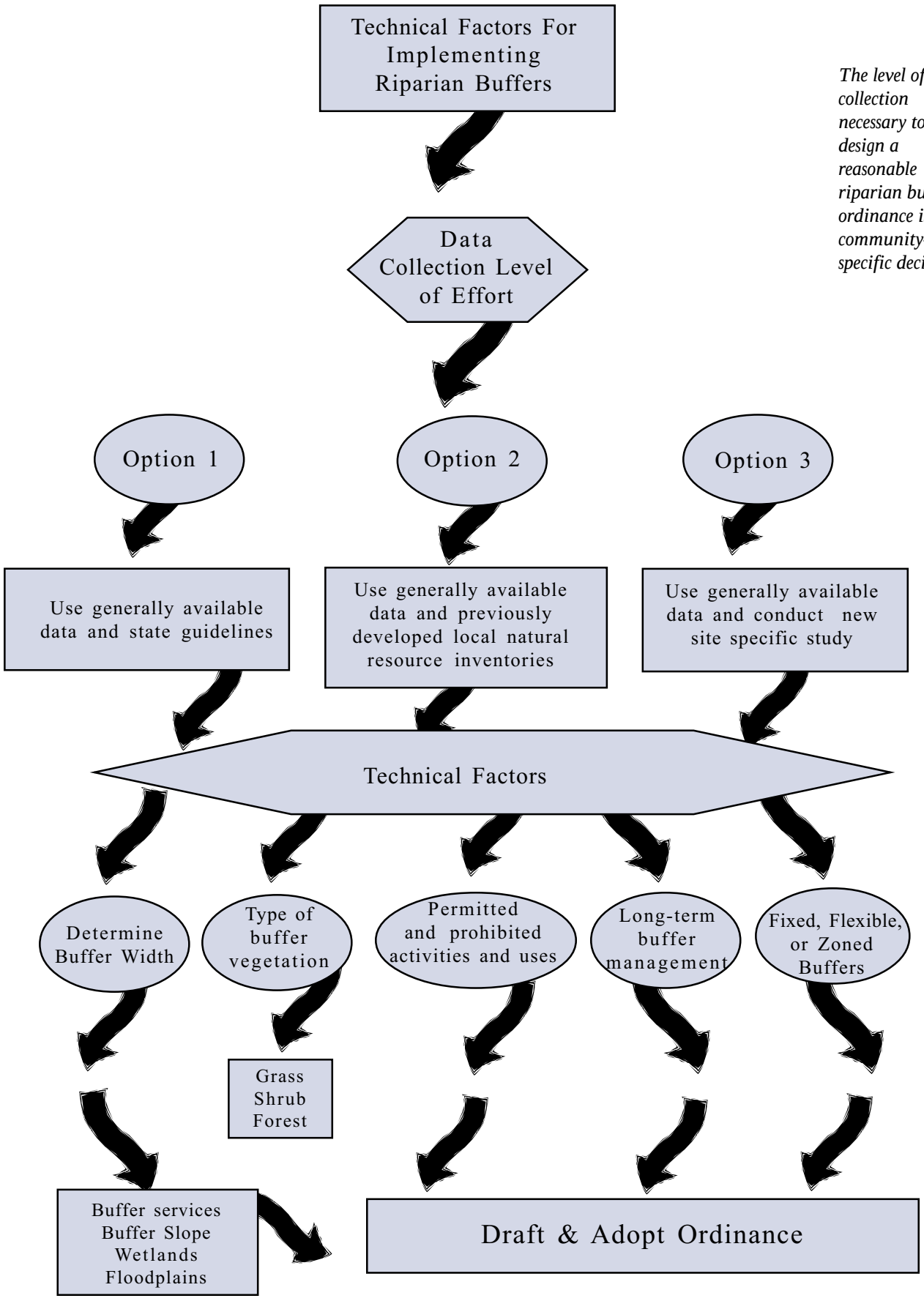
One approach to setting minimum buffer widths is to base width on subwatershed size. The Chagrin River Watershed Partners (CRWP) recommends 120 feet on each side of perennial streams for subwatersheds greater than 20 square miles and 75 feet on each side of perennial streams for subwatersheds less than 20 square miles. For intermittent streams, regardless of subwatershed size, CRWP recommends 25 feet on each side. These widths are measured from the ordinary high water mark and should be expanded where necessary due to the 100-year floodplain, wetlands and steep slopes.

Type of Buffer Vegetation

All riparian buffer vegetation is not created equal. Buffer vegetation such as unmowed grasses, shrubs, and forests with leaf litter, provide a greater resistance to runoff flow than vegetation such as maintained lawns. This resistance slows the flow of runoff into streams and allows pollutants to settle out before entering the water. Buffers

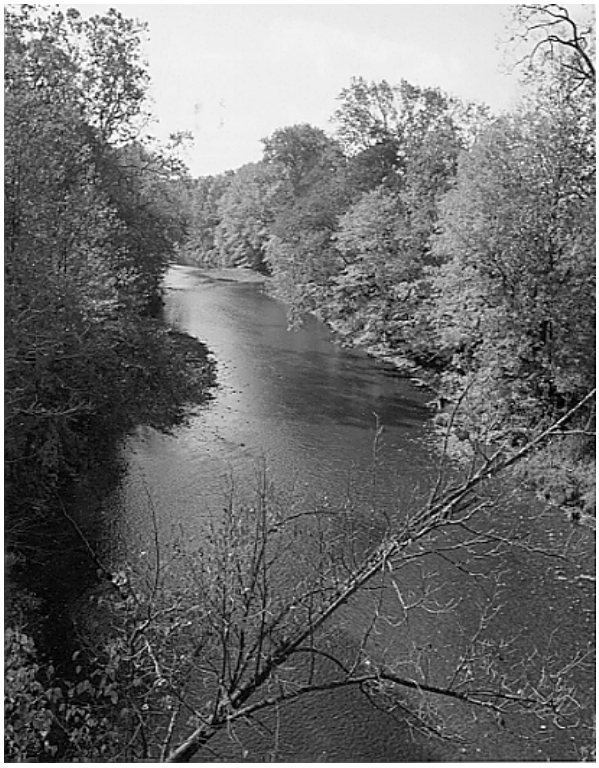
(continued on page 18)

RIPARIAN BUFFERS - TECHNICAL CONSIDERATIONS



The level of data collection necessary to design a reasonable riparian buffer ordinance is a community-specific decision.

Thomas Offutt



The Chagrin River.

continued from page 17

dominated by shrubs and trees also minimize bank erosion by providing the root structure necessary to hold bank soils in place against stream flow. Forested riparian buffers also shade rivers. This shade stabilizes water temperatures, an essential function for water quality and aquatic life. To maximize a riparian buffer's ability to filter runoff, prevent bank erosion and protect aquatic habitat, a buffer ordinance should encourage locally appropriate forms of vegetation that resist flow, stabilize banks, and shade streams.

Permitted and Prohibited Activities and Uses

A successful buffer ordinance should make clear what activities and uses will be permitted within the buffer area. Generally, uses and activities that disturb soils or vegetation should be prohibited. However, allowances for limited construction and timber harvest may be provided under certain circumstances that should be explicitly stated in the ordinance.

Long-Term Buffer Management

To ensure the success of its buffer ordinance, a community will need a long-term plan for management of the area. This plan should include requirements for the delineation of the buffer on all pertinent community maps and for the education of landowners. The commitment of staff necessary to implement and enforce the buffer area, as well as a plan for the training of the staff, should also be included. There should be a monitoring and evaluation program to determine if the ordinance is being implemented and enforced, and how it is working to protect the buffer area.

Fixed, Flexible and Zoned Buffers

Fixed buffers are not the only available format. Riparian buffers can also be implemented as flexible buffers or zoned buffers.

Flexible riparian buffer programs determine width based on site-specific information. If properly implemented, the result can be riparian buffers better tailored to the characteristics of particular parcels. However, this process can be more time consuming and costly for communities.

In the zoned approach an overall buffer width, such as 120 feet from the ordinary high water mark on each side is determined. This buffer area is then divided into two or three zones based on proximity to the river. Restrictions on the uses and activities in these zones lessen as the distance from the river increases. The zoned approach recognizes the importance of the relative distance from the river by establishing a hierarchy of activities within the buffer area. As with data collection and the other technical considerations, the decision on buffer format is community specific.

Final Points

This article introduced you to several components necessary for the development of a successful buffer protection program through local ordinance. A riparian buffer protection ordinance is only one component of a watershed approach to natural resource management. To fully protect against flooding, erosion, nonpoint pollution, groundwater depletion and habitat loss, a riparian buffer ordinance needs to be implemented in conjunction with other natural resource protection measures, including storm water management that focuses on water quality and quantity; the protection of sensitive natural areas; and subdivision and zoning ordinances that minimize impervious surface.

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Thomas J. Denbow is the executive director for the Chagrin River Watershed Partners, Inc.

This article is taken from a larger paper prepared for CRWP members entitled "Riparian Buffers: Technical Information for Decision Makers." Please contact CRWP for a bibliography or the full paper at Chagrin River Watershed Partners, Inc., 2705 River Road, Willoughby Hills, OH 44094, 440-975-3870 or by e-mail at drywell@en.com.

The Chagrin River Watershed Partners, Inc is a local non-profit organization working for its member communities in the Chagrin River watershed to address flooding, erosion and other natural resource management concerns.

CASE STUDY

21 Years: The Ever-changing Bear Creek

A Visual History of Riparian Zone Restoration

Story and photos by Wayne Elmore

Riparian restoration and management has been a major issue in the arid West since the mid-1970s. Early restoration efforts were mainly the responsibility of wildlife and fisheries biologists and concentrated on the exclusion of livestock for habitat improvement.

Through experience and research we have learned that the restoration of our riparian areas affects much more than just "wildlife and fisheries habitat." Natural areas alongside creeks and streams influence water quality, aquifer recharge, sediment filtering, energy dissipation, late season stream flows, reduction in erosion, and rebuilding of the stream banks. This is accomplished through stream function— the interaction of water, soil and vegetation. A stream functions properly with the correct hydrology, and adequate amount and appropriate kind of vegetation, and where erosion and deposition is in balance with the stream.

We now know that to produce the values we want from our streams and associated riparian areas, we must have "functioning systems." Only when these basic functions exist in streams do we produce the effects we desire. Riparian restoration and management is all about one basic factor — keeping water on the land longer. Everything else we want from streams and riparian areas is built upon this one simple process.

Bear Creek in Central Oregon gives us a unique opportunity to observe a stream over 21 years of change. As you look at each photo of this stream, analyze your own feelings about what you see. As you go from one photo to the other, assume that you are arriving at this stream for the first time and rating it on its progress and condition. Think about what you would expect the stream to look like next year, what changes will occur from certain climatic events or changes in management practices?

August 1977. Streamside vegetation was low in diversity, stream banks were actively eroding, the channel was deeply incised and high flows contained moderate to high sediment loads. Stream flow in the summer was often intermittent and low in quality.

May 1983. Banks are healing and channel is narrowing. Sediment, trapped by vegetation, can be seen on the banks in the newly emerging plants. Junipers in foreground, seen in previous photo, were cut to release upland vegetation and see if this practice would affect willow establishment. The large juniper on the hillside was left and is seen in some of the remaining photos.

August 1986. Channel has narrowed considerably and nearly one-and-a-half feet of sediment has been trapped on the flood plain. Existing vegetation will carry over to filter sediment and reduce stream energies for bank protection the next year.

Bear Creek

Background

In 1976 I started photographing and working on Bear Creek, which is located at approximately 3,500 feet elevation in the high desert of Central Oregon. Precipitation averages 12 inches per year with peak runoff occurring in mid to late February. Summer thunderstorms are fairly frequent. The area had been grazed by domestic livestock since the late 1800s and the licensed use in 1976 was 75 animal unit months (AUMs) from April until September. Surveys during this year revealed that the riparian area totaled 3.8 acres per mile of stream and produced approximately 200 pounds of forage per acre. That meant if livestock ate all the available forage and used 800 pounds per AUM, it took one mile of stream to support one cow for one month. Stream banks were actively eroding, the channel was deeply incised, flows were frequently intermittent, and runoff events contained high volumes of sediment. The riparian area was storing less than 500,000 gallons of water per mile.

In 1976-78 the Bureau of Land Management (BLM) partially rested the are from grazing in an attempt to restore the productivity of the riparian area. In 1979 and 1980 the area was grazed from one week in September and from 1981-1984 it was not grazed. Juniper trees on the adjacent hillsides were thinned in 1983 to improve upland conditions, reduce erosion, and to see if this action would increase willow regenerations. During 1985 the pasture was divided into three units with money supplied from the county grazing board and labor provided by the permittee. The grazing was changed from season-long to a three pasture late winter/early spring use period. These dates normally follow the early runoff event for this stream system. This allowed vegetation to be present for bank protection and regrowth of vegetation during the critical summer months from thunderstorm events and livestock forage for the following year.

Results

By 1989 the licensed use had increased to 354 AUMs, five times the amount previously grazed from the area. The livestock permittee reportedly reduced his annual cost of hay by $10,000 because of less winter feeding. In 1996 the riparian area had grown to 12 acres

June 1987. Vegetation along the banks filtered sediment from a summer flood event. The raising of the flood plain also caused the channel to widen.

August 1987. Two months after the previous photo, vegetation is seen growing up through the newly deposited sediment stabilizing it on the floodplain.

October 1988. The channel is now fully revegetated from the 1987 flood and the floodplain is now more than two feet higher than in 1976.

August 1993. Drought periods are important for this type of stream. The sedges and rushes seek out the lower water table and occupy almost all of the channel. This vegetation will help slow water velocities and trap sediments the next year. The stream is now perennial where it used to go dry even during wetter years.

November 1995. Beaver can have a dramatic effect on channel shape and water storage. Their impacts change with the condition of the channel and the vegetation present. Beaver have a hard time keeping dams in streams in poor condition. This photo was taken slightly downstream from the previous photos because of the beaver dam.

February 1996. Flood event caused by a heavy snow pack and fast runoff.

April 1996. The increased channel stability from the riparian vegetation minimized stream channel damage from the February flood. The vegetation filtered approximately five inches of sediment.

October 1996. The stream channel and riparian area continue to improve.

per mile of stream and was now producing approximately 2,000 pounds of forage per acre. The production had increased 30-fold. The filtering of sediments by the vegetation had raised the stream bed by two-and-a-half feet and we were now storing nearly four million gallons of water per mile. Stream length (sinuosity) had increased by one-third of a mile in the three mile stretch, also helping keep the water on the land longer. Rainbow trout had finally returned.

Conclusions

We have learned a lot about the compatibility of livestock with the restoration and management of riparian areas since the mid-1970s. Some of the more important lessons include:

1) Timing, intensity and duration are usually more important than numbers of livestock;

2) Values cannot be perpetuated until basic stream function is established;

3) The most important factor in success is commitment by the operator;

4) One grazing strategy does not fit all streams;

5) Present riparian condition is very important in setting goals and objectives;

6) Upland condition must be included in any restoration program;

7) Climate cycles dramatically affect restoration rates;

8) Droughts are just as important as floods to riparian recovery; and

9) Restoration and sustainability of riparian resources occurs only when we utilize the interest produced in our riparian systems and not the capital.

There is a lot we need to do, and still much to learn, to restore the functionality of our streams and riparian areas. We can only do it if we work on the entire stream system together. This means we have to be able to communicate our thoughts and ideas and set our biases aside long enough to agree on common goals and objectives.

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CASE STUDY

Urban Riparian Restoration in the Difficult Run Watershed

by Judy Okay

Background

Difficult Run is a tributary of the Potomac River and is a valuable living resource. At 58 square miles, its watershed is the largest in Fairfax County, Virginia.

Intensive development within the watershed has resulted in reduced riparian buffer widths; in some cases, these buffers have been eliminated entirely. Widespread clearing of trees and replacement of vegetation by impervious surfaces associated with commercial and residential development has significantly increased the volume, timing, and velocity of water entering Difficult Run following rainfall and snowmelt events.

In response to the continuing loss of streamside buffers and the associated impacts to streams, the Virginia Department of Forestry initiated the Difficult Run Riparian Project six years ago.

Project Description

The objective of the Project is to improve water quality in the Difficult Run watershed. It was initiated to assist communities in restoring urban streams. The watershed-wide reforestation effort is a partnership between State and local government, and Fairfax County citizens. Funding is provided, in part, by Virginia's Coastal Zone Management Program (Department of Environmental Quality). A variety of activities are being utilized:

- reforest riparian buffer zones
- develop local, state and federal partnerships
- sponsor public education programs
- promote innovative approaches

Protocol for Evaluation of Priority Riparian Buffer Restoration Sites:

In 1994, an interagency work group developed a protocol for the evaluation of riparian buffers; the protocol provided the basis for evaluation of priority riparian reforestation sites. Members of the work group included representatives of the Virginia Department of Forestry, the Metropolitan Washington Council of Governments, Fairfax County Park Authority, and the Prince William County Soil and Conservation District. The established protocol comprises the following two steps for selection of priority planting sites:

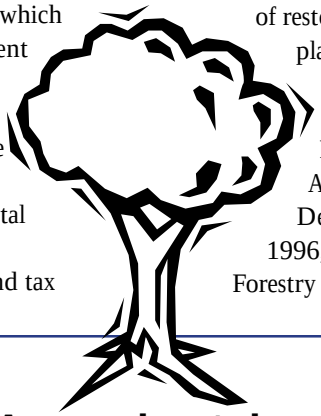
(1) Perform vegetation inventory to determine the extent to which the riparian area and adjacent floodplain has undergone a loss of vegetation.

(2) Select and prioritize restoration sites to achieve the maximum environmental benefit using a vegetation inventory, local land use and tax maps, soil maps and descriptions, topographical maps, and aquatic resources needs of local stream conditions.

The Virginia Department of Forestry began the Difficult Run Riparian Project by identifying priority restoration sites along the mainstem. Criterion considered during the evaluation process are summarized below.

A value of 1, 2, or 3 was assigned to each criterion referenced in the table on page 23, a value of "1" representing a poor score and a "3" representing a good score. Following the evaluation of each site, the sum of points was divided by the number of criterion that were applied to the site, insuring a constant scoring system throughout the evaluation process. If a criterion could not be attributed to the site, no points were scored for that characteristic. The scores from each sheet were totaled and sites were prioritized according to their need for restoration. Sites with the lowest overall score were the highest priority sites for riparian buffer restoration.

The protocol was used to evaluate seven sites along the Difficult Run mainstem for reforestation needs; five of the seven sites were found to be in need of restoration. The sites were planted in the spring of 1994 under the supervision of Fairfax ReLeaf, Fairfax County Park Authority, and the Virginia Department of Forestry. In 1996, the Department of Forestry began expanding the project to the Difficult Run tributaries.



Approximately 14,300 tree and shrub seedlings have been planted in riparian areas since 1993.

Riparian Reforestation

The Difficult Run Riparian Project has been ongoing since 1993. Priority enhancement areas were first identified and impaired floodplain areas were then targeted for planting efforts. Approximately 14,300 tree and shrub seedlings have since been planted in riparian areas. In 1995, a 150-foot buffer was established near a residential subdivision development. More than 500 citizen volunteers have participated.

There have been three school plantings. Six local, two state, and two federal agencies as well as three nonprofit organizations have been involved. Fairfax ReLeaf, a local nonprofit, has supplied many of the volunteers and helped execute the plantings.

Watershed-wide Education and Outreach Program

The objective of this program is to mobilize citizens to further efforts to improve water quality through the establishment of healthy riparian buffers. The maintenance and enhancement of restored areas will be a primary goal.

An interactive watershed model, display board and brochure, cooperatively developed, have been invaluable in educating the public about how riparian forest buffers can prevent and reduce runoff pollution. A Difficult Run Watershed Festival was held to create public awareness about the reforestation projects to date and to enlist support for future projects. Fairfax ReLeaf sponsored an urban reforestation workshop in conjunction with the Festival which spawned additional planting and streambank restoration projects.

Project Impact

The expected outcome of the Difficult Run Riparian Project includes:

- improved water quality
- increased wildlife habitat
- improved flood control
- lower levels of nonpoint source nutrients
- improved aesthetic value for buffer zones
- decreased streambank erosion

These anticipated benefits are directly related to re-establishment of forested riparian buffers along the Difficult Run's mainstem and its tributaries.

Although water and habitat quality improvements are difficult to document in a short time, research projects are under way to accomplish this. Cutting edge technology, such as Global Positioning System (GPS) units and Geographical Information Systems (GIS) mapping are being used. A world wide web homepage (www.state.va.us/~dof/riparian.htm) has been established to share information about watershed projects with professionals and the general public.

Judy Okay is the coordinator for the Difficult Run Riparian Project,12055 Government Center Parkway, Suite 904, Fairfax, VA 22035, 703/324-1489.

Criteria for Identifying Restoration Sites

Criterion for Site Selection	Definition
Cover Type	Characteristic vegetation living in study area
Density	Quantity of plants per unit area
Continuity	Same cover type without interruption
Contiguous	Adjoining land or cover types
Land ownership	Property rights by purchase or dedication
Adjacent Land Use	Land use directly surrounding study area
Recreational Use	Used for leisure activities
Buffer	Sufficient vegetation to protect and provide easy transition between different land uses
Stream Order	Importance of stream based on size and number of tributaries
Stream Hydrology	Properties of stream flow
Stream Morphology	Characteristics of stream based on stream banks/bed
Slope	Land contours or elevation variances
Erodability	Tendency of soil to be displaced by wind or water
Sensitive Resources	A resource easily destroyed or damaged
Fisheries	Aquatic environment capable of supporting fish species

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Champion

Champion International has developed a riparian protection zone policy for their forestlands in Maine, New Hampshire, Vermont, and New York that goes further than current environmental regulations in any of these four states. The strategy took effect in 1996 and addresses the full range of values, such as fisheries, wildlife, water quality, and recreation, that are associated with riparian zones.

Formulated by a team of Northeast Region foresters, led by a Champion wildlife biologist, and assisted by a wildlife ecologist from New Hampshire Fish and Game Department, this policy is based on two ideas:

1) that as streams get larger, there are more riparian values that require greater protection;

2) that all streams – no matter how big or small – contribute to the overall riparian system and deserve some protection.

For more information about Champion's policy on riparian protection zones, please call Gary Donovan at their Northeast Forest Resources office (207/469-1275), or write Champion International Corporation, Forest Resources, PO Box 885, Bucksport, Maine 04416.

	First-Order Streams	Second-Order Streams	Third-Order Streams	Fourth-Order (and higher) Streams
Characteristics	The tiniest streams, unbranched, may be seasonal or year-round. They're fast-flowing (usually with a 3% gradient or greater), with bouldery bottoms, and they usually don't influence the surrounding vegetation.	Combination of two perennial first-order streams, but still small. Like the first-order streams, they're fast-flowing (usually 0.5 percent gradient or greater), with bouldery bottoms, and they usually don't influence the surrounding vegetation.	Combination of two second-order streams. They tend to be slower-moving (less than 0.5 percent gradient), with sandy or loamy bottoms. The streams are still relatively small, but the adjacent areas are subject to periodic flooding and therefore different from the surrounding forestlands.	Combination of two third-order streams. As streams turn into rivers, their riparian effect broadens.
Significance	Source of cold water and energy (in the form of organic material) for larger streams. Not usually good fishing, but important to good fish habitat downstream.	Same as for first-order streams.	Fisheries and wildlife habitats are more important than in first- and second-order streams; recreational values become more evident.	Provides fish and wildlife habitats for a greater number of species than found in either open water or upland sites, reflecting the diversity of plant species. Rare, endangered, and threatened fish and wildlife species are more likely encountered in this portion of the watershed. Significant recreational uses include fishing, hunting, trapping, canoeing, kayaking, and wildlife watching.
Width of Zone	100 feet on each side of stream.	100 feet on each side of stream.	330 feet on each side of stream.	660 feet on each side of stream.
Protection Objectives	Protect water quality; provide adequate shade (not less than 60-70 percent crown closure) to keep water cool and ensure supply of organic material; intercept eroded material before it reaches stream; maintain living root systems to stabilize stream banks.	Same as for first-order streams.	Same as for first- and second-order streams. Also, provide crown to facilitate mobility for mammals, particularly during the winter, allowing access to food and shelter and opportunities to escape from predators; leave wildlife (snag and den) trees; provide adequate shade to keep water cool ; provide overhead cover for fish.	Same as for first-, second-, and third-order streams. Also, accommodate the breeding territory requirements of most songbirds; create and maintain high-quality fisheries and wildlife habitats, including habitats for endangered, threatened, or rare species; and accommodate a variety of recreational uses.

References & Resources

PUBLICATIONS

A Citizen's Guide to Conserving Riparian Forests by Susan C. Peterson and Kenneth D. Kimball. A cooperative project between River Network and the Appalachian Mountain Club. A handbook for identifying and protecting riverside forests. Emphasis is on Northeastern U.S., but many concepts covered are applicable elsewhere. Includes guidelines for establishing buffers (width), case studies, and bibliography of research. 1995. Available from River Network, P.O. Box 8787, Portland, OR 97207, 503/241-3506. $7.

Guidelines for Gathering and Mapping Ownership and Other Data for River Corridor Lands Prepared by Maria Van Dusen and Russell A. Cohen for the Riverways Program, Massachusetts Department of Fisheries, Wildlife and Environmental Law Enforcement,100 Cambridge Street, Room 19001, Boston, MA 02202, 617/727-1614 ext.358.

Riparian Buffers: Technical Information for Decision Makers. Contact the Chagrin River Watershed Partners, Inc. for a bibliography or the full paper at: 2705 River Road, Willoughby Hills, OH 44094, 440-975-3870 or by e-mail at drywell@en.com.

Riparian Buffer Programs: A guide to developing and implementing a riparian buffer program as an urban stormwater best management practice. Produced by the Metropolitan Washington Council of Governments Department of Environmental Programs, 777 North Capitol St, NE, Suite 300, Washington, D.C. 20002. Phone: 202/962-3256.

A Citizen's Streambank Restoration Handbook by Karen Firehock and Jacqueline Doherty. A 111-page guide to restoring eroding streambanks using vegetation and flexible systems to stabilize streambanks and restore stream corridors. Features installation guidelines, sample budgets, case studies and tips for choosing the best solution for your stream. $18. To order, call (800)BUG-IWLA and place a credit card order Monday-Friday 9 A.M. to 5P.M. EST. Or email sos@iwla.org and order a catalog with order form.

Riparian Road Guide: Managing Roads to Enhance Riparian Areas. A step-by-step, cost-effective and practical approach to road building and repair that results in both clean water and safe roads. Includes photographs and charts that clearly explain new and emerging techniques. Written for local governments and road designers and contractors, this guide is also of interest to environmentalists and travelers. Prepared in cooperation with EPA Region 6. 1994, 32 pages, H10 $10.95 Contact: Order Department, Terrene Institute, c/o Order Department, P.O. Box 605, Herndon, VA 20172-0605 Tel: 703/661-1582, Fax: 703/661-1501 or email: terrinst@aol.com

ORGANIZATIONS

The National Conservation Buffer Council is a private-sector organization dedicated to the promotion of agricultural conservation practices. The agribusiness firms that fund the Buffer Council activities are Cargill, Inc., ConAgra, Inc., Farmland Industries, Inc., Monsanto Company, Norvatis Crop Protection, Inc., Pioneer Hi-Bred International, Inc., and Terra Industries, Inc. The new Clean Water Action Plan calls for USDA, working with federal, state, tribal, and private partners to establish 2 million miles of conservation buffers on agricultural land by 2002. The National Conservation Buffer Council is helping to achieve that goal. Contact David Stawick, president: (202) 879-0253

ONLINE RESOURCES

Fact Sheets on Functions and Values of Riparian Areas. Includes fact sheets relating to riparian areas to flood control, storm damage prevention, wildlife habitat, fisheries protection, protecting public and private water supplies, groundwater protection, protection of land containing shellfish, pollution prevention and the importance of protecting riparian areas along smaller brooks and streams. Prepared by Russel Cohen, River Advocate, Riverways Program, Massachusetts Department of Fisheries, Wildlife and Environmental Law Enforcement. <www.magnet.state.ma.us/dfwele/river/rivfstoc.htm>

Smithsonian Environmental Research Center. Click on "electronic publications" and then on "Dave Correll's Riparian Zone Bibliography" to get a substantial bibliography of studies addressing removal of contaminants and nutrients by riparian buffer plantings. <www.serc.si.edu>

NRCS Buffers Information Page. Includes links to funding sources; state-by-state agency contacts; practice requirements and planning aids, job specification sheets; and more. Some information requires the use of Adobe Acrobat Reader (downloadable from the site.) <www/fb-net.org/buf-idx.htm>

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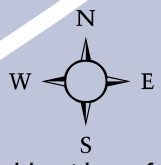

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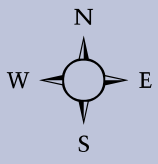
Kevin Bixby, SW Environmental Center, NM



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