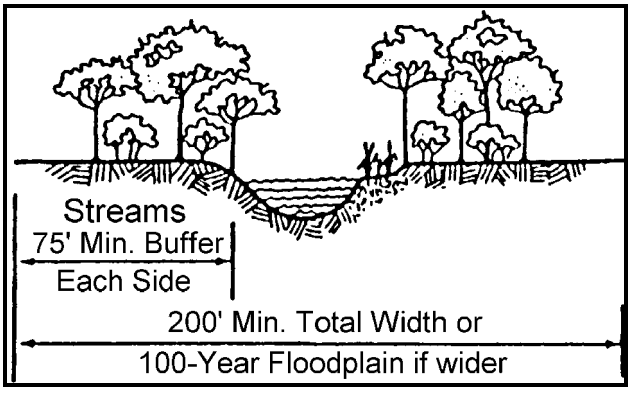
3.1 Streamside Landscape Buffers

The Buffer Concept

The concept of a buffer is fairly simple. A buffer is a continuous vegetated strip of land comprised of the types of native plants which naturally exist in an undisturbed riparian setting. In contrast, a turf grass lawn down to the water's edge is not a buffer strip.

Buffers require little maintenance. In particular, the use of fertilizers is unnecessary, and pesticides should not be needed once the buffer is well-established. Buffer strip characteristics can vary depending on the stream or river setting. A buffer may be forest, prairie, or wetland. It may be 25 feet wide along a small headwater stream or hundreds of feet wide along a larger river. Most intrusions into the buffer are discouraged, but flexibility should be provided to allow appropriate user access.



Stream buffer example from Dane Co. Wisconsin.

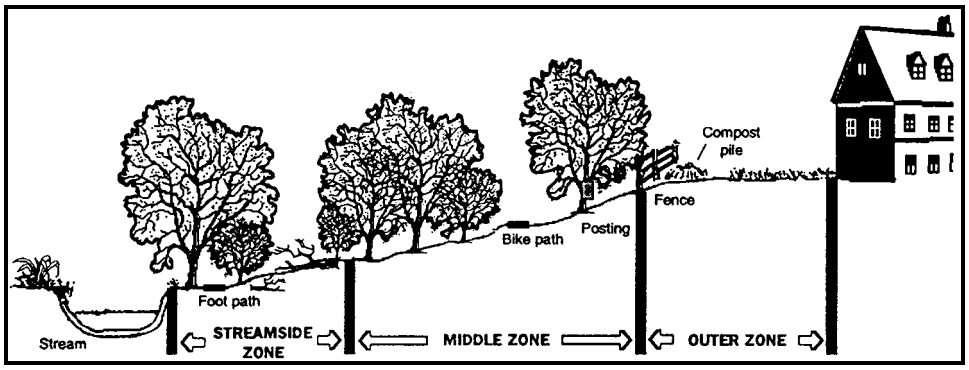
Rationale and Benefits of Natural Buffer Strips

Ecologists, water quality specialists, land planners, and stream managers all agree that a naturally vegetated buffer strip along the periphery of a stream or river is critical to the health and quality of the waterbody. A stable buffer is the last line of defense for forces that may seriously threaten a healthy, stable stream system.

Channel stabilization: Perhaps most importantly, a naturally vegetated riparian buffer lends stability to streambanks, warding off the erosive effects of high flow velocities and fluctuating water levels. This is accomplished by the soil-binding effect of a

healthy root system and the deflection of erosive flows by lush above-ground growth.

Fish and wildlife habitat: Riparian buffers are essential to maintaining natural biodiversity in a stream corridor. Most importantly, a stream edge buffer provides critical habitat for fish and various aquatic insects, helping to maintain a balance in sensitive aquatic ecosystems. Riparian buffers also provide a transition zone between terrestrial and aquatic habitats, which is necessary for the survival of a number of birds, mammals, and amphibians. If sufficiently wide, riparian buffers also provide a connecting corridor for the migration of animals between larger open spaces.



A zoned buffer system, from *Site Planning for Urban Stream Protection*.

Runoff filtering: A vegetated buffer filters runoff generated by surrounding land uses, removing or mitigating the effects of harmful chemicals, nutrients, and sediments before they can reach the stream.

Shading: Depending on the width of the stream and the type of vegetation used, buffers can provide substantial shading. Shading is important to keep stream water temperatures cool in the summertime and may help to limit nuisance growths of algae.

Noise screening: Buffers can enhance the quality of stream and river recreational uses by filtering out the noise associated with certain types of adjacent land uses. Forested buffers, where appropriate, can effectively intercept noise from adjacent highways and industrial operations.

Preservation of aesthetic values: Streamside property owners have varying senses of what is appropriate streamside landscaping. However, most will agree that "natural" is better than "artificial." Even a narrow buffer can enhance the view across a stream or river. More substantial buffers can effectively screen the clutter of surrounding urban developments.

Buffer Design

Buffer characteristics can vary widely depending on local circumstances. However, there are several basic components of any buffer.

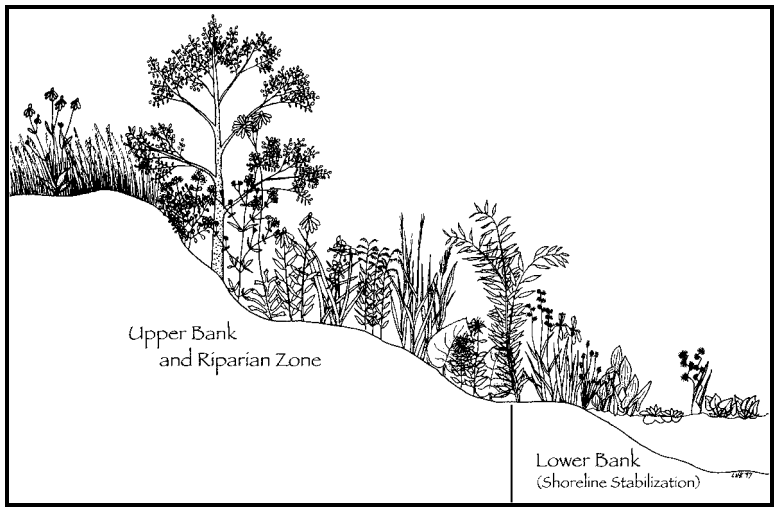
Width: Any width of native vegetation along the edge of a stream will provide some benefits. However, it is recommended that a buffer extend a minimum distance of 25 feet from the edge of the water, or what is commonly called the "ordinary high water mark." Wider buffers—50 to 100 feet, or more—should be protected for larger and more ecologically-sensitive streams and rivers. The U.S. Department of Agriculture recommends "filter strips" of 66 to 99 feet for water quality protection. A recent national survey of local and state guidance for stream buffers observed a median width of 100 feet, with a range between 20 and 200 feet.

Intrusions: While a continuous, uninterrupted buffer is preferable for protection of water quality and habitat, some flexibility is desirable to provide access to the stream for recreational uses, particularly in parks and other public lands. Access typically would be provided via a mown footpath. Less intrusive pedestrian access could be provided via a stepping stone trail. Paving through a buffer is strongly discouraged, although limited intrusions may be acceptable to accommodate trail access.

Vegetation: It is recommended that buffers be planted with native species which are indigenous to a particular locale. The Federal Land Survey, conducted in the mid-1800s, provides a good general indication of the vegetation communities that existed prior to European settlement. It distinguishes between wetland, prairie, and woodland communities and provides a good

indication of the type of vegetation which is naturally acclimated to the soils, hydrology, and climate of an area. It may surprise many landowners to know that most of the smaller stream and river corridors in the region were historically vegetated with wetland and prairie grasses and flowers, not trees.

In selecting plants for a buffer it should be noted that it is not necessary, or even feasible under most circumstances, to return the buffer zone to a pre-settlement condition. Rather, information on native riparian vegetation should be used as a guide to restore important *functions* such as bank stability and wildlife habitat.



Planting zones within a buffer. Modified from *Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois*.

Buffer vegetation should begin at or below the normal water elevation with wetland species, and should proceed up the bank with water tolerant and upland species. Buffer vegetation also should reflect local needs and conditions. For example, a forested buffer may be appropriate if noise screening is desired but may not be appropriate if local residents desire an unobstructed view. Similarly, some property owners will prefer a greater mix of showy wildflowers, which may be less "functional" than other prairie plants but will enhance the beauty of the stream corridor.

A listing of suggested plant species which adapt well in urban and suburban stream buffers is provided at the end of this section. This list distinguishes between lower bank and upper bank zones. It also highlights several aggressive, invasive species which are undesirable in a riparian buffer. Species are considered undesirable if they crowd out more desirable species and they: 1) have limited soil-holding ability because of shallow root structure (like Reed Canary Grass), 2) provide little or no habitat value (like Purple Loosestrife), and/or 3) shade out understory vegetation (like Common Buckthorn). These undesirable species should never be intentionally planted in a riparian zone and steps should be taken to eliminate them if they already exist.

A much more thorough discussion of appropriate buffer species is provided in the *Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois* (NRCS, 1997). This reference provides detailed information on individual plant characteristics as well as plant suitability under various hydrologic and water quality regimes.

Another suggested reference that should be useful to landowners considering the conversion of buffers to native plant communities is *The Tallgrass Restoration Handbook*. While it applies predominantly to upland environments and its advice is intended principally for "serious" restoration efforts, *The Tallgrass Restoration Handbook* nonetheless provides a wealth of current advice from practitioners who have successfully converted and restored natural landscapes in this region.

Finally, it also should be noted that the buffer recommendations contained in this handbook are intended for relatively basic streamside landscaping applications. Where there is a desire to implement a more complete restoration of a high quality riparian ecosystem, and hydrologic and water quality conditions are suitable, additional assistance should be sought from a trained ecologist.

Buffer Installation

There are two equally-important steps in establishing or restoring a buffer: site preparation and planting. However, the specific approach taken on a given site will vary depending on the size of the site and the conditions in the riparian zone.

Site preparation: Site preparation is critical to ensure that native vegetation has good growing conditions and is not overwhelmed by invasive species. One of several typical conditions may exist on a site prior to buffer installation: 1) the existing buffer is not regularly maintained and is overgrown with undesirable vegetation; 2) the buffer zone is vegetated principally with turf grass; or 3) the buffer is in a transitional state (e.g., from agricultural to residential) where bare soil may be predominant. Recommendations for each of these conditions follow.

If the buffer is ***overgrown with undesirable species***, buffer installation should begin with the removal of the unsuitable vegetation. Some of the most objectionable species are listed in the table at the end of this section. Possible techniques include cutting, mowing, burning, hand pulling, and herbicide application.

Cutting generally will be necessary for undesirable trees and shrubs. Sometimes it will be necessary to treat the stumps with a herbicide to prevent resprouting, particularly for species such as Common Buckthorn. Landowners should be aware that use of such herbicides (e.g., Garlon 4a) generally requires a licensed applicator.

Undesirable herbaceous species should be treated via some combination of mowing, burning, hand pulling, and herbicide application. The appropriate techniques for a particular site will depend on local conditions. Because native landscape restoration is an evolving field, even experts may disagree on the best approach for a given site. In general, if infestations are limited, hand pulling may be effective. Where infestations are severe, some combination of herbiciding and burning may be necessary. While this handbook recommends the use of herbicide as a possible alternative for several vegetation management situations, landowners should be very cautious and judicious in its use. In particular, in riparian environments care should be taken avoid to herbicide spraying in the stream channel.

If the buffer zone is ***vegetated principally with turf grass***, site preparation needs may be minimal. Some experts recommend herbicide application or removal of the sod layer to reduce competition with newly-planted native species. In some cases, shallow tilling may be appropriate. Tilling is discouraged, however, in riparian areas that are subject to frequent inundation or erosive water flow velocities. Also, it is important that exposed soil be quickly stabilized using temporary seeding, straw mulch, and/or other appropriate techniques.

If the buffer is ***in a transitional state and bare soil is predominant***, herbicide application still may be appropriate to reduce competition from emerging weeds.

Planting: Planting should be done immediately after site preparation is completed. Planting can be done with live plants and/or seeds.

Where project budgets allow, use of live plants, in combination with seeding, is preferable because it results in rapid establishment of vegetative cover. Live plants are particularly desirable on streambanks which are susceptible to frequent inundation. It generally is desirable to install most live plants in the spring or early summer to allow for effective root establishment before the following winter, although some species are best planted in the fall. Most trees and shrubs also can be planted in a dormant state in the fall.

Because most project budgets will allow for only limited use of live plants, seeding typically is used over the majority of the buffer zone. Where seeding is done, it is important to use a cover crop (see suggestions at the end of this section) to quickly establish a stable vegetative cover. Depending on the season, planting native vegetation seeds may be deferred until moisture and temperature conditions are appropriate. In general, most native plants should be seeded in the spring. As an alternative, dormant seeding may be done in the late fall or winter. The *Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois* should be consulted for information on appropriate seeding techniques and conditions.

To prevent seeds and soil from washing away, several techniques should be considered. Where stabilizing root structures of herbaceous plants are already present, use of a no-till drill is recommended. Where bare soil is present, the seed should be raked into the ground and erosion blanket should be installed to maintain soil

moisture and minimize erosion. In riparian areas where inundation is unlikely, mulch is a less-expensive alternative to erosion blanket.

If unusually dry conditions persist after planting or seeding, short-term irrigation may be necessary to prevent desiccation. Irrigation generally will not be necessary, however, if planting is done in the recommended seasons.

Buffer Maintenance

The most critical time for buffer maintenance is shortly after planting. During this period, herbaceous plant species are putting most of their energy into the establishment of root system, and relatively little growth may occur above ground. It is particularly important, therefore, to limit competition from aggressive, non-native plants. During this period, mowing and/or selected use of approved herbicides may be necessary to control weed species. When mowing to suppress weeds, practitioners generally recommend mowing high (e.g., 9 to 12 inches). If weed problems are particularly severe, it may be advisable to contact a professional landscape contractor familiar with native vegetation for advice.

Once the buffer is well established (typically within 1-3 years), maintenance will involve occasional mowing or prescribed burns to suppress weeds and maintain native plant diversity. Where site conditions permit, burning generally is the preferred maintenance approach because it is a natural process that rejuvenates native plant communities, particularly prairies and wetlands, and can effectively suppress weeds. However, burning requires an Illinois Environmental Protection Agency permit and should be conducted only by trained individuals.

If certain noxious weeds need additional control, limited use of approved herbicides may be appropriate in localized areas. Use of fertilizer is not necessary and should be avoided in the buffer strip.

Local Examples

The Chicago Botanic Garden in Glencoe recently created a twelve-acre buffer along a nearly one mile stretch of the Skokie River. The created buffer averages about 50 feet in width on both sides of the channel and consists of several "oxbow" wetlands and an evolving prairie community. The former landscape was dominated by Kentucky bluegrass and invasive weeds. Site preparation involved a prescribed burn in the spring to remove thatch followed by the application of herbicide (glyphosate) to kill emerging non-native vegetation. Initial prairie planting was done using a no-till drill technique to reduce soil disturbance and avoid activating the weed seed bank. A low-cost mix of annual rye and eight species of prairie grasses and forbs was seeded at a rate of 16 pounds per acre. This was supplemented by hand seeding an expanded array of native species in subsequent years. Wetland zones were planted by volunteers with live plants. While the buffer is still a work in progress, it has clearly transformed the landscape of the river corridor and greatly enhanced wildlife and water quality functions. This site is easily viewed from trails and roadways along the west side of the Garden property.

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Citizens for Conservation (CFC), a non-profit citizens group based in the Barrington area, owns and manages several parcels of land. In 1996, it began restoration of a 1000-foot buffer along Flint Creek upstream of Route 22 in Lake Barrington on a site called the Flint Creek Savanna. The riparian zone was almost entirely dominated by Reed Canary Grass, a species that has become a troublesome invader of riparian zones throughout the area. Two techniques were used to eliminate Reed Canary Grass. Parts of the riparian zone were mechanically scraped, physically removing existing vegetation and the top six inches of soil that contained most of the root zone. Dormant seeding was applied to these areas in the fall. Remaining riparian areas were treated by successive applications of burn management and

herbicide. Treated areas were planted by volunteers with plant plugs. Subsequent applications of a selective herbicide that does not harm sedges and forbs were made to eliminate Reed Canary Grass sprouts. Supplemental seeding and planting were done by volunteers early the following summer. Planted vegetation spread effectively, and by the end of the 1997 growing season the buffer was very well-vegetated with a diverse mix of native species, and there was almost no evidence of Reed Canary Grass. While long-term conclusions can not yet be drawn, the short-term restoration results are highly encouraging and visually striking. The rehabilitated riparian buffer is now an integral habitat component of the Flint Creek Savanna, blending with adjacent prairie, wetland, and oak savanna communities.

Contact: Tom Vanderpoel
Citizens for Conservation
P.O. Box 435
Barrington, Illinois 60011
847/462-0358 (at Savanna Landscaping Co.)

Suggested References

Landscaping Techniques and Materials for Urban Illinois Stream Corridors and Wetland Edges, R.D. Mariner and L. Mertz-Erwin, Northeastern Illinois Planning Commission, for the Illinois Department of Energy and Natural Resources, 1991.

Model Stream and Wetland Protection Ordinance, Northeastern Illinois Planning Commission, 1988.

Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois, USDA Natural Resources Conservation Service's Chicago Metro Urban and Community Assistance Office, in cooperation with U.S. Environmental Protection Agency, Region 5, U.S. Fish and Wildlife Service, Chicago Field Office, and U.S. Army Corps of Engineers, Chicago District, December 1997.

Natural Landscaping: A Sourcebook for Public Officials, Northeastern Illinois Planning Commission, May 1997.

Site Planning for Urban Stream Protection, T. Schueler, for Metropolitan Washington Council of Governments, December 1995.

Stream and Wetland Protection: A Natural Resource Management Priority in Northeastern Illinois, D.W. Dreher, R.D. Mariner, and C. Hunt, Northeastern Illinois Planning Commission, 1988.

Tallgrass Restoration Handbook, S. Packard and C.F. Mutel, eds., Island Press, Washington, D.C., 1997.

Suggested Plant Species Mixes

These lists are derived principally from the *Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois.* The suggested plant species mixes are intended to provide landowners with an idea of species that could be used together in riparian and streambank zones. Selection of species for a given site should factor in local environmental conditions, such as soils, hydrology, and pre-settlement vegetation, as well as aesthetic considerations. Generally, it may be desirable to overlap planting of different species mixes given the varying, and sometimes uncertain, hydrologic regime in a given zone. It should be noted that the recommended species lists represent a limited diversity of plants, emphasizing those species that should be relatively easy to establish in *rehabilitating* modified riparian zones. For prairie, woodland, or wetland *restorations*, planting mixes should go beyond the species listed here.

Lower Bank (Streambank Stabilization)

Water Plantain	*Alisma subcordatum*
Fox sedge	*Carex vulpinoidea*
Hackberry	*Celtis occidentalis*
Common Buttonbush	*Cephalanthus occidentalis*
Gray Dogwood	*Cornus racemosa*
Red-Osier Dogwood	*Cornus stolonifera*
Blunt Spike Rush	*Eleocharis obtusa*
Creeping Spike Rush	*Eleocharis acicularis*
Nodding Wild Rye	*Elymus canadensis*
Virginia Wild Rye	*Elymus virginicus*
Green ash	*Fraxinus pennsylvanica*
Fowl Manna Grass	*Glyceria striata*
Common Sneezeweed	*Helenium autumnale*
Rice Cut Grass	*Leersia oryzoides*
Switch Grass	*Panicum virgatum*
Peachleaf Willow	*Salix amygdaloides*
Black Willow	*Salix nigra*
Chairmaker's Rush	*Scirpus americanus*
Late Goldenrod	*Solidago gigantia*
Prairie Cord Grass	*Spartina pectinata*
Blue Vervain	*Verbena hastata*
Nannyberry	*Vibernum lentago*

In severe erosion situations where the dormant stake method is appropriate, sandbar willow (*Salix interior*) may be recommended due to its aggressive behavior.

Undesirable Species

Box Elder	*Acer negundo*
Garlic Mustard	*Allilaria officianalis*
Tartarian Honeysuckle	*Lonicera tatarica*
Purple Loosestrife	*Lythrum salicaria*
Reed Canary Grass	*Phalaris arundinacea*
Common Buckthorn	*Rhamnus cathartica*
Glossy Buckthorn	*Rhamnus frangula*
Multiflora Rose	*Rosa multiflora*

Upper Bank and Riparian Zone

Big Bluestem	*Andropogon gerardi*
Smooth Blue Aster	*Aster laevis*
Panicled Aster	*Aster lanceolatus*
New England Aster	*Aster novae-angliae*
Common Beggar's Ticks	*Bidens frondosa*
Side-oats Gramma	*Bouteloua curtipendula*
Hackberry	*Celtis occidentalis*
Tall Coreopsis	*Coreopsis tripteris*
Gray Dogwood	*Cornus racemosa*
Red-Osier Dogwood	*Cornus stolonifera*
Nodding Wild Rye	*Elymus canadensis*
Virginia Wild Rye	*Elymus virginicus*
Green ash	*Fraxinus pennsylvanica*
Wild Bergamot	*Monarda fistulosa*
Switch Grass	*Panicum virgatum*
Purple Prairie Clover	*Petalostemum purpureum*
Common Mountain Mint	*Pycanthemum virginianum*
Swamp White Oak	*Quercus bicolor*
Bur Oak	*Quercus macrocarpa*
Pin Oak	*Quercus palustris*
Yellow Coneflower	*Ratabida pinnata*
Black-eyed Susan	*Rudbeckia hirta*
Little Bluestem	*Schizachyrium scoparium*
Compass Plant	*Silphium laciniatum*
Prairie Dock	*Silphium terebinthinaceum*
Stiff Goldenrod	*Solidago rigida*
Indian Grass	*Sorghastrum nutans*
Prairie Cord Grass	*Spartina pectinata*
Spiderwort	*Tradescantia ohiensis*
Common Iron Weed	*Veronia fasciculata*
Arrow-Wood Viburnum	*Viburnum dentatum lucidum*
Nannyberry	*Vibernum lentago*

Cover Crops

Annual Ryegrass	*Lolium multiflorium*
Smartweed	*Polygonum punctatum*
Yellow Coneflower	*Ratabida pinnata*
Black-eyed Susan	*Rudbeckia hirta*