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Waterbreaks: Managed Trees for the Floodplain

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Introduction

Historically, many of the natural woody ecosystems that were once present in floodplains across the country have been highly altered or removed. Land clearing has resulted in the loss of woody vegetation, even in areas adjacent to streams and rivers. With these alterations, came extensive flood management commitments to compensate for the loss of naturally functioning floodplains and for the protection of towns, roads, and agricultural fields. However, even with the best available flood management techniques, when rivers decide to flood - they will, often with devastating consequences. Strictly from a social and an economic standpoint, allowing the floodplain to revert to a completely natural state would be a radical and largely unpopular action. Nonetheless, creating a floodplain system that accommodates, rather than controls flooding, and still maintains its economic and biological attributes, has been shown to be an acceptable alternative. A key to this is reestablishing trees in carefully planned and managed waterbreaks.

Definition

A waterbreak is a planned floodplain system of linear woody buffers oriented to reduce flooding impacts and to provide supplemental benefits. The placement and use of waterbreaks are intended to moderate water flows similar to the way windbreaks moderate wind flows.

Trees along this streambank will effectively control bank and surface erosion.

Planning Considerations

When planning any floodplain waterbreak system, it is essential to consider the following elements for the system to function properly:

- Landowner objectives
- Existing landscape features
- Applicable laws and regulations
- Historical flooding frequency
- Potential secondary uses
- Current and future use (agricultural, industrial, or community)
- Aesthetic, social, and safety aspects
- Upstream and downstream watershed characteristics

  In addition, complex ownership patterns may require group planning for proper waterbreak design, function, use, and management.

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Design

General

Waterbreak systems can be complex. They should incorporate all the important aspects of the site. In general, when designing waterbreaks:

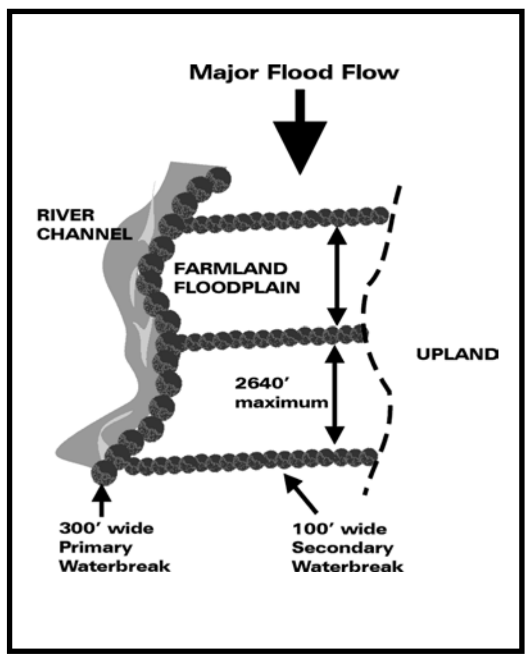
- Complement natural features with location, layout, and density of the buffer.
- Assess the severity of bank erosion and its influence on existing or planned plant material establishment.
- Incorporate bank stability activities wherever and whenever needed.
- Avoid waterbreaks at locations that would concentrate flood or return flows.
- Join new waterbreaks with existing trees when possible to increase the continuity.
- Favor tree and shrub species that are native and have multiple values, such as those suited for timber, biomass, nuts, fruit, browse, nesting, and aesthetics.
- Use species that are adapted to local flooding conditions.
- Avoid tree and shrub species which may be alternate hosts to undesirable pests or that may be considered noxious or invasive.
- Employ species diversity to avoid loss of system function due to species-specific pests.
- Use species selection to improve aesthetics, such as seasonal foliage color, showy flowers and fruit, foliage texture, form and branching habit.
- Plant on raised beds or ridges to improve soil aeration and increase spring soil temperatures.

Properly planned, waterbreaks can effectively trap flood debris.

Specific

A typical waterbreak system should include primary waterbreaks that parallel stream courses in corridor widths of 50 to 100 feet for smaller water courses and 300 feet for large rivers. Secondary or interior waterbreaks of 25 to 100 feet in width should be established along field borders or every half mile, whichever is less (width varies with stream size and site needs). The interior waterbreaks should be established perpendicular to anticipated flood currents and tie into primary waterbreaks and non-flooding elevations. Additional interior waterbreaks might be strategically planted to divert potentially damaging flood currents away from sensitive or critical areas.

To provide quick protection, follow the planting recommendations outlined in *AF Note* 5, “Riparian Buffer Design for Cropland,” using large vigorous growing stock six to 10 feet apart for trees and three to six feet apart for shrubs. Shrub plantings should be restricted to the leeward side (downstream side for interior waterbreaks and field side for primary waterbreaks) of the waterbreak to minimize potential damage from flood debris and sediments. If raised planting beds are used, ridges or



Typical waterbreak layout designed to reduce flooding damage to farmland adjacent to a large river.

berms should be 10 to 12 inches in both height and top width. A minimum of three different tree species should be planted in the waterbreaks to reduce insect and disease risks and to improve wildlife benefits. A grass zone is optional, but if desired, use grass species that are flood tolerant, such as switch grass, prairie cord grass, or Reed canary grass.

Management and Maintenance

Once the waterbreak system is installed, proper maintenance is necessary to provide lasting long-term benefits. Some of the more important actions are:

- Replanting to maintain gap-free waterbreaks to avoid the potential for severe scouring.)
- Weed control for the new woody vegetation until trees and shrubs can compete on their own.
- Protecting woody plantings from wildlife browsing and livestock damage.
- Periodic debris removal along the stream-side edge of the waterbreak.
- Periodic harvesting or thinning of waterbreak vegetation to maintain vigorous plant growth and achieve wood product specifications.

Costs

Typical establishment costs may vary greatly from site to site, depending on type and size of planting material used, need for outside labor, site preparation needs, and cost-sharing opportunities. The table to the right gives some typical items to consider and projected costs for establishing a waterbreak on an 8 foot x 8 foot spacing (680 trees per acre).

Example of Typical Establishment Costs

Activity Typical Costs ($/acre)	Total ($)
• Site preparation (disking)	$15
• Tree planting (includes materials and labor)	$345
• Weed control (chemical)	$37
• Mowing	$13
• Total	$410

State and federal programs may be available to help landowners offset some establishment costs and to provide incentive payments to maintain riparian systems. Contact local USDA Service Centers for more information on available cost share programs.

Benefits

Properly designed, waterbreak systems can provide many benefits to floodplain ecosystems. Waterbreaks, during flooded conditions, trap debris, reduce sand deposition and scouring, increase bank stability, protect levee systems, and reduce damage to roads and ditches.

Flood damage evaluations and on-site observations from the 1993 Midwest Flood (a 500-year flood event) showed that fields protected with tree corridors experienced 25 percent to 75 percent lower reclamation costs (costs varied from $25 per acre to over $3000 per acre). In addition, post flood research on a 39-mile stretch of the Missouri River showed 90 percent less levee damage where woody corridors exceed 300 feet in width. Studies in Kansas for the same flood event showed that land-cover vegetation significantly affected the amount of streambank erosion. Forested streambanks actually collected soil, whereas, grassland lost an average of 78 feet of lateral bank area and cropland lost an average of 150 feet.

During non-flooded conditions, waterbreaks increase wildlife habitat, improve water quality by trapping sediments and filtering chemicals which can provide additional farm income from the sale of wood products and through increased opportunities for fee hunting. Some of these benefits may be experienced as early as the second growing season following establishment.

"Protect Streambanks with Trees." Geyer, W. A., T. Neppl, and K. Brooks. Kansas State University Agricultural Experiment Station and Cooperative Extension Service. Keeping Up With Research. SLR 122 October 1998.

"Stewards of our Streams: Buffer Strip design, Establishment and Maintenance." Iowa State Extension Bulletin Pm-1626b April 1996.

Additional Information

"Value of Woody River Corridors in Levee Protection Along the Missouri River in 1993." Dwyer, J.P., D. Wallace, and D. Larsen. 1997. Journal of the American Water Resources Association, 33(2): 481-489.

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