



Timber Stand Improvement



Most woodlands in Kansas are along rivers and streams in riparian forests. A healthy riparian forest is needed to provide maximum benefits for timber production, water quality, wildlife, and people. Active management may be the best way to maintain a healthy riparian forest.

Timber stand improvement is an effective management tool used to increase the health and productivity of the woodland. A healthy riparian forest serves as an effective buffer to filter out excess sediment, nutrients, and other pollutants in runoff from adjacent lands.

Timber stand improvement focuses on the improvement of crop trees. Crop trees are those kept for future harvest, wildlife, or aesthetics. Improvement of crop trees can be achieved by removing competing trees and vines, or by pruning. These activities open up the canopy to release seedlings of desirable species in the understory, allow crop trees to grow more quickly in diameter and develop bigger crowns, and improve the quality of sawlogs on future crop trees. At the same time crop tree quality is increased, the riparian forest will continue to function as a buffer and provide benefits to water quality.

Benefits and Value

There are many ways riparian forests help maintain and improve water quality (Figure 1.) One way is by acting as filters for nonpoint source pollution. As water from adjacent land flows through the riparian forest buffer, it is slowed by tree trunks, understory vegetation, and the organic litter layer. When the water is slowed, sediment settles out and nutrients, such as nitrogen and phosphorus, and harmful bacteria are removed. The sediment, along with the leaf litter,

creates a porous organic layer that allows for infiltration of the water into the soil. Woodland soils have a high infiltration rate, which means much of the surface runoff percolates into the ground and is filtered by the soil.

The forest canopy (leaves and branches) also helps maintain water quality by providing shade to the stream, keeping water temperatures low and oxygen at adequate levels for aquatic life. The leaves, limbs, and trunks that enter the water naturally are a critical source of organic



Figure 1. A healthy riparian forest buffer helps maintain and improve water quality.

matter needed by the stream's inhabitants for spawning, food, and shelter.

Unmanaged woodlands can become less productive. Overstocked forests with many small diameter trees can lead to underdeveloped crowns, poor tree growth, and poor form. This can result in low-quality timber, high tree mortality, an underdeveloped organic layer, and little to no understory or natural regeneration. Vines on trees can out-compete tree leaves for light and can eventually kill trees. All of this can lead to unhealthy riparian forests.

Management of riparian forest buffers through timber stand improvement helps maintain the productivity of the buffer. Removal of undesirable tree species that compete with crop trees improves the growth of more valuable trees. As trees mature they need more room to increase in diameter and spread their branches. By removing lower quality trees and/or undesirable tree species from the woodland, the remaining trees will have better diameter growth and healthier crowns. In addition, openings created by thinning will help promote regeneration of seedlings in the understory. Thinning a buffer can also be a way to create a more diverse tree component. Healthy trees and a diversity of tree species mean a more productive riparian forest buffer and improved water quality.

Implementation of Practice

Timber stand improvement in a riparian forest must be done carefully and should be planned with the help of a forester or other trained natural resource professional. Important things to remember include: minimize the disturbance of the forest floor to keep the organic

layer intact; keep machinery out of the stream by using properly constructed stream crossings; remove trees and large branches that fall into the streams; and properly dispose of debris. Methods of disposal include removal of wood debris for other use such as firewood, creating brush piles for wildlife habitat, or burning. For debris that is left in the woodland, slash the material to make sure it is in contact with the ground to speed up decomposition. When planning timber stand improvement, consider the selection of crop trees, which trees to remove, and the method of removal.

Crop Tree Selection

The crop trees selected depend on the goals of the landowner for timber stand improvement, and certain trees may be kept for timber value, aesthetics, or wildlife. In any case, the trees kept as crop trees will depend on the species and on the vigor and form of the tree.

Tree Species

The tree species that are kept depend on the overall goal of the thinning. If wildlife is important, mast bearing trees such as oak, walnut, and hickory should be favored. Several large, coarse limbed trees such as sycamore and cottonwood may be kept as roosting trees for turkeys and herons.

If a timber harvest is the objective, more valuable species such as walnut, oak, maple, and ash should be favored over less desirable species such as Osage-orange, honey locust, elm, and box elder.

If species diversity is the goal, healthy trees of several species should be selected to keep.

Tree Health and Form

It is important that crop trees selected are in good health without

evidence of sickness such as insect infestation, large wounds or fungi. If there is interest in a future harvest, healthy trees with straight trunks and few branches and forks should be favored to stay.

Trees that are not in good health should generally be removed. However, keep in mind some should be kept as snag trees to provide food and shelter for wildlife. If cavity nesting birds are important to the landowner then some trees with hollows and broken branches should be retained. Three dead or dying trees per acre is generally accepted. Trees with unique form or other characteristics also can be kept for aesthetics.

Tree Removal

The trees removed from a riparian forest buffer during timber stand improvement will depend on crop trees selected, natural regeneration present, total number of trees present, and location of trees in relation to the body of water. There are also several methods to kill and/or remove the trees. The method used will depend on the level of experience and the preference of the person implementing the timber stand improvement.

Crop Trees and Regeneration

Competing trees should be removed around selected crop trees on two or three sides to open up the crowns, which will increase diameter growth and timber value. If there is an area with several trees that would qualify as crop trees, the best ones should be selected and the others removed. A pair of close crop trees can be selected if the crowns are released from other competition. In other areas where a crop tree has not been selected but there are many seedlings of desirable species in the understory trees may also be removed to create an opening for

sunlight to reach the forest floor to release the seedlings.

Number of Trees Removed

The number of trees removed depends on the goal of the thinning and the number of trees present at the time of timber stand improvement. No more than 25 percent of the stand should be removed within the riparian area. While enough trees should be removed to release crop trees, an over-thinned stand should be avoided. Just as an over-stocked stand is unhealthy, an over-thinned stand will be a less effective riparian buffer.

Location within the Riparian Forest Buffer

The location within the riparian forest where the trees are harvested or removed through timber stand improvement is important. Trees within 15 feet of a streambank should only be removed if they will not affect the stability of the streambank. Only remove a tree directly on the streambank if it has very high timber value (i.e. black walnut), as it may have higher value for streambank stabilization if left standing.

Some trees may be undercut and leaning out over the water, threatening to fall into the streams. In such a case, the top may be cut, leaving about 2 feet of the trunk still in the ground. This will remove the pressure on the roots while allowing the roots to continue to hold the soil together. Most trees will re-sprout and continue to provide browse to wildlife and streambank stabilization.

Methods of Tree Removal

The most common method of removal of trees during timber stand improvement is using a chain saw to fell the trees. Felling however, is not always the most convenient method.

There are different methods that can be used to kill trees without cutting them down. These include single or double girdle with or without herbicide, and hack and squirt. To girdle a tree, a chain saw is used to cut a ring 1 to 2 inches into the tree trunk at a comfortable height above the ground. If a double girdle is used, the second ring is cut into the trunk about 3 inches above the first ring. When girdling a tree an herbicide may be used to kill the tree more quickly. Because of the proximity to water only an herbicide approved for use near streams and wetlands should be used with careful application techniques.

Another alternative is the hack and squirt method where an axe is used to cut through the bark into the cambium and herbicide is squirted into the fresh cut. Hacks are usually spaced 3 to 4 inches apart, so a 4-inch diameter tree may require three cuts while a 10-inch diameter tree may require eight cuts. Always follow the label instructions. Again, when using herbicide in a riparian forest buffer, it is important to make sure it is approved for use near water.

Pruning

To increase the value of crop trees left behind for a future harvest, lower branches should be pruned. Pruning is labor intensive so it should be limited to trees with good form and to those species such as walnut, pecan, and oak where it will be most beneficial. Removing branches reduces knots and defects on the logs and adds value to crop trees that will eventually be harvested.

Branches should be pruned when they are 2 inches or less in diameter (Figure 2), as these cuts will heal faster than large wounds. Live branches should be pruned just outside of the branch collar and the bark ridge that forms where the branch meets the stem. The cut should angle down and away from the tree stem. Branches should not be cut flush against the main trunk as this results in a large wound and can cause decay in the main stem.

No more than one third of the live crown should be removed from the tree in any one year. Dead branches should be pruned at the branch collar where the woundwood tissue has begun to form.

Vine Removal

Vines growing up crop trees should be killed. In many cases, if vines are left alone they can be detrimental to the health of the tree (Figure 3.) Vines such as poison ivy and Virginia creeper have root-like structures that cling to the tree trunk and into the crown. Grape vines tend to grow up the tree and wrap around branches extending into neighboring trees as well. Once the vines enter the crown they compete for and limit the amount of sunlight the tree receives. This reduces the ability of the tree to produce food and eventually can lead to decline. Additionally, hanging vines can cause top breakage of the tree in

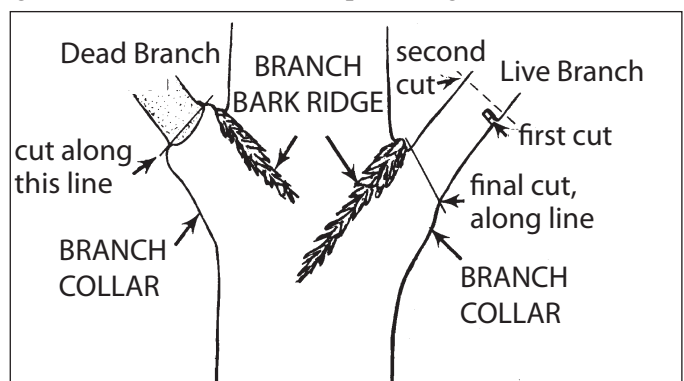


Figure 2. Pruning should be done correctly in order to reduce re-sprouting and decay.

wind or ice storms, which will also cause decline of the tree.



Figure 3. Vines on the trunk and branches of a hackberry tree.

Ideally vines should be removed before they grow into the crown of the tree. For larger vines, a

1- to 2-foot section should be cut near the ground to ensure they will not grow back together. Hanging vines should be cut so that when they swing free they do not come in contact with the ground as they will re-root. The cut stub attached to the roots should be treated with the appropriate herbicide to prevent re-sprouting. The upper end of the vine will wither and fall away on its own. Although vines may pose a problem to the health of trees, some vines are beneficial to

wildlife and may be left to grow on the edges of the forests or on undesirable tree species. Vines that bear fruit and berries, such as grape and dewberry, are an excellent and needed food source for birds and other wildlife. Others vines, such as greenbrier, provide excellent shelter for birds.

For additional information on timber stand improvement, cost-share opportunities, or technical assistance, contact the Kansas Forest Service, your local conservation district office, K-State Research and Extension office, Natural Resources Conservation Service office, or the Kansas Department of Wildlife and Parks.

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