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Impacts of Harvesting in Wetlands.*

Results from *Studies at Auburn University*

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Bottomland hardwoods have long been considered a highly valued resource among forest companies and non-industrial private forest landowners in the southern United States. Unfortunately, over the past century in particular, approximately 27 million acres of bottomland hardwoods have been converted to other land uses (principally agriculture). Consequently, only about one-third of the original acreage of these highly productive ecosystems remain forested (Sharitz and Mitsch 1993).

Income production from bottomlands, either through resource extraction or on-site activities, provides a powerful incentive to maintain these areas in a forest type.

Understanding water velocity is the key to minimizing sediment production from roads.

In addition to their potential for timber, wildlife, and other on-site uses, bottomland or "riparian" hardwood forests have the capacity to influence the quality of surface and subsurface waters associated with large extents of the southern landscape. This attribute has been referred to as the "kidney" function; waters that drain watersheds encompassing thousands of acres pass through and are influenced by processes within the riparian forests. For example, nitrates coming from non-point pollution in subsurface and surface drainage arc greatly reduced when the water passes through a riparian forest. This reduction occurs through conversion of nitrate to gaseous N and uptake in vegetation, two fates that produce much more environmentally stable forms of nitrogen compared to waterborne nitrates. Consequently, society's benefits due to the presence of bottomland hardwood forests extend well beyond their geographic boundaries.

Bottomland forests are like a valuable antique auto; while the car is attractive to look at, the owner cannot realize the full rewards of ownership without driving it. Since it is a complex, high-performance vehicle, the owner wants to ensure that it is driven without causing any damage. Many of the values of bottomland hardwood forests come from active management and use. But it is critical to ensure that use does not compromise function. Fortunately, these goals are not mutually exclusive for either the car owner or hottomland hardwood manager.

A Cooperative Research Program

The Auburn University School of Forestry has developed a research program to provide scientific information about the effects of management activities in bottomland forests. In most cases, these studies 'have involved clearcutting with natural regeneration combinations, although two projects have examined partial harvests. These studies have been implemented on the floodplains of the Little Escambia Kiver in Alabama, the Flint River in Georgia, the Pearl in Mississippi and a landscape-scale study in the Sepulga River basin of Alabama.

Due to the scope of these projects and the substantial resources required to perfonn the research, all of the studies have involved partnerships and cooperation between Auburn University and many private and public organizations. Forest industries that have been involved with wetlands harvest projects include Scott Paper Company (now Kimberly-Clark), Georgia-Pacific Corporation and International Paper Company. The landscape-scale Sepulga Basin project involves International Paper Company, Union Camp Corporation, Jefferson Smurfit. Temple-Inland Corporation, and the American Forest and Paper Association (AF&PA).

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Most of the wetlands harvesting studies have also been supported by the National Council of the Paper Industry for Air and Stream Improvement (NCASI). In addition to the USDA Forest Service Engineering and Southern Hardwoods Projects at Auburn and Stoneville, Mississippi respectively, the Environmental Protection Agency (EPA) and Alabama Department of Environmental Quality (ADEM) have been involved with these projects to varying extents.

While all projects have emphasized a sound research approach to accurately assess impacts on vegetation, water, soils and fauna1 populations, a significant outreach component has also been maintained throughout the series of investigations. For instance, approximately 500 land managers, foresters, researchers and public agency representatives have toured Auburn wetlands harvest study sites. Many others have seen the research findings through presentations at research, continuing education and technology transfer meetings.

*There are indications that neither ground-based not helicopter logging reduce site **productivity.***

Main Findings

While some studies are ongoing, and thus final results have yet to be determined, much has been learned regarding the manner in which bottomland hardwood forests respond to silvicultural treatments. These results will be discussed separately for vegetation, soils, water and faunal bioindicator populations and are discussed in greater detail in Locknby et al. (in press).

Vegetation

Ground-based harvesting alters the species composition of regeneration due to damaged root stocks and improved seed germination conditions. In general, species regenerating primarily from seed will bc favored by ground-based harvests while those regenerating primarily from root stocks will be reduced. The ramifications of species alterations depend on the landowner's management objectives (i.e., which species are preferred for timber and/or wildlife).

There are indications that neither ground-based nor helicopter logging reduce site productivity. However, we do not yet know how any type of harvest influences productivity relative to that of the pre-existing bottomland stand.

Water

One of our firmest conclusions is that, ***as long as BMP's arefollowed,*** there is no evidence that the harvest operation alone (whether ground- or aerial-based) generates any form of pollution to surface or ground water. However, as discussed below, questions remain regarding roads, stream crossings, etc. The ability of a riparian forest to perform the important cleansing kidney function appears to be affected only minimally by clearcuts and partial harvests. (Lockaby et al. 1994).

Soils

After ground-based harvests, reductions in saturated hydraulic conductivity (the ability of subsurface water to move laterally) have been recorded on most harvest study sites where soil factors were evaluated. This raises the question of effects on productivity since hydrology is the key factor controlling vegetation productivity in any wetland. A linkage between harvesting effects on soil and vegetation growth has not been established at this time. Short-term changes in nutrient availability and hydrology have also been recorded following both types of

harvests but have not been linked to changes in vegetation dynamics. The nutritional and hydrological changes seem to diminish once canopy closure is re-established.

Wildlife Bioindicator Populations

Amphibian populations are often monitored in wetlands as indicators of general ecosystem integrity or health. Our results show that in certain types of floodplains the number of species and individuals decline sharply following clearcutting. However, the rate at which re-establishment of canopy closure occurs controls the rate of population recovery. As in the case of vegetation productivity, long-term effects have yet to be evaluated.

Roadbuilding Impacts

The effects of roadbuilding methods on water quality were examined in the study on the Flint River. Four road surfacing treatments (two thicknesses of gravel, vegetative stabilization and native material) were compared. There were no detectable differences in suspended sediment in floodwaters among the surfacing treatments. While the crown of the road showed a slight loss, the ditches accumulated sediment for a net gain. Water velocity is the key to minimizing sediment production from roads. Where floodwaters move slowly and steadily across the floodplain, minimal sediment generation occurs. However, where flow is concentrated by structures such as culverts, high fills or debris dams, special erosion reduction measures are likely to be required.

Conclusions

The best hope for conservation of our bottomland hardwood forests is careful management for multiple values. Income production from bottomlands, either through resource extraction or on-site activities, provides a powerful incentive to maintain these areas in a forest type. However, it is imperative that active management does not impair other important ecological functions of the bottomland. Our research is contributing to the scientific information about complex and subtle bottomland processes. This information will help resource managers make better decisions about how management can be conducted in an ecologically-sensitive and technically-feasible manner.

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