NCASI Forest Environment and Sustainability Research

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The National Council for Air and Stream Improvement (NCASI) is a non-profit research institute that focuses on environmental and sustainability topics relevant to forest management and the manufacture of forest products. NCASI has served the forest products industry since 1943. Through research investigations, surveys, and other information-gathering activities, NCASI helps ensure that ongoing dialogue and decision-making about environmental policies related to the forest sector are grounded in technical information of the highest possible quality. Many of NCASI's research activities are conducted in collaboration with forest products companies, universities, government agencies, and other organizations.

The NCASI Forest Environment and Sustainability Program undertakes scientific studies to enhance technical understanding of environmental and sustainability issues associated with forest management and wood procurement practices, including those associated with forest bioenergy feedstock production. NCASI has supported studies and literature reviews related to topics such as:

- Environmental responses to intensive forest management practices, options for managing harvest residues, and production of purpose-grown bioenergy feedstocks in managed forests;
- Efficacy of forestry best management practices for protecting water quality; and
- Effects of forest management on wetland hydrology, biogeochemistry, water quality, and species diversity.

Below are several examples of recent and ongoing research projects in which NCASI is involved as a cooperator and are relevant to production of forest bioenergy feedstocks.

Examples of Recent/Ongoing NCASI-supported Research

Harvest Residue Retention in Loblolly Pine Forests. NCASI recently supported a study of biodiversity and soil property responses to retention of 0, 15%, 30%, and 100% of woody material that normally would be removed as part of a biomass harvest. The treatments were applied in loblolly pine (*Pinus taeda*) forests in North Carolina and Georgia following commercial clearcut harvests. Collaborators included North Carolina State University, the University of Georgia, Plum Creek Timber Company, Weyerhaeuser Company, Georgia Pacific, U.S. Department of Agriculture, Forest Guild, Biofuels Center of North Carolina, and others.

Fall River Study. Goals of the Fall River Study are to assess effects of biomass removals (e.g., commercial bole only, total tree, total tree plus all legacy woody debris), soil compaction, tillage, and vegetation control on site properties and growth of planted Douglas-fir (*Pseudotsuga menziesii*). Study cooperators include Weyerhaeuser Company, the University of Washington, the U.S. Forest Service, and others. The Fall River research site in coastal Washington is an affiliate installation of the North America Long-Term Soil Productivity network. Treatments, were established in 1999. Results to date show a positive effect of herbicides and little impact of intensive biomass removals on tree growth and soil carbon.

Harvest Residue Management in Aspen and Red Pine Forests. Biomass harvesting guidelines for retaining harvest residues on site are based, in part, on the assumption that decomposing residues enhance soil C and site productivity. Field studies have yielded inconsistent effects of residue retention on soil C, although high variability across forested sites following harvesting could mask underlying trends. NCASI is thus supporting a field study to assess the proportion of residue C lost as CO2 vs. that incorporated into soil during decomposition and factors controlling the fate of harvest residue C. Investigators are sampling aspen (*Populus tremuloides*) and red pine (*Pinus resinosa*) stands in the Upper Peninsula of Michigan to assess forest floor and soil C within, adjacent to, and between cut-to-length rows that represent different harvest residue loading rates at varying intervals following harvest. Carbon is being analyzed in residue, forest floor and soil samples, and trends in litter and soil C will be regressed against residue loading to determine the effect of residues on sequestration. Michigan Technological University and Plum Creek Company (now Weyerhaeuser Company) are collaborating on the study.

Estimation of Residual Harvest Residue Volumes. Most biomass harvesting guidelines contain provisions for leaving specific quantities or proportions of harvest residues on site. However, documenting the quantities and characteristics of retained harvest residues is labor-intensive and costly. The University of Georgia has recently developed drone technologies with the potential to rapidly quantify residues remaining on site following harvesting. NCASI is collaborating with the university to field test these technologies in order to develop a rapid assessment tool.

Effectiveness of Best Management Practices for Stream Crossings. Forest roads facilitate harvest and transport of forest bioenergy feedstocks but, in some cases, may deliver sediment to streams. State agency surveys have repeatedly shown that best management practices (BMPs) for construction and maintenance of forest roads are implemented at high rates and are effective in reducing risks to water quality. NCASI, Virginia Tech, and others are cooperating to test sediment delivery associated with BMPs for forest road ditches, including bare ditches, seeded ditches, silt fences, water turnouts, check dams, and graveled ditches. Effects and costs of ditched and non-ditched haul road stream crossings on sediment delivery in the Virginia Piedmont and Mountain regions are also being modeled.

Aquatic Salamander Response to Intensive Forest Management. This study is exploring relationships between presence of stream-associated salamanders and characteristics of adjacent intensively managed forests in the Ouachita Mountains ecoregion of western Arkansas. Cooperators include Weyerhaeuser Company, and the University of Arkansas. Investigators are using repeated surveys of >75 stream sites to assess the influence of natural (e.g., stream characteristics, elevation, aspect, slope, etc.) and forestry-related (e.g., adjacent stand age and structure, structure and width of streamside buffer) factors on occupancy and abundance of stream-associated salamanders. Study results will document the extent to which forestry BMPs protect aquatic ecosystems, including species of conservation interest.

Sustainability of Switchgrass Intercropping in Pine Forests. NCASI has been collaborating with Weyerhaeuser Company and Catchlight Energy LLC, a Chevron|Weyerhaeuser joint venture, and others in several studies of environmental implications of intercropping switchgrass (*Panicum virgatum*) within intensively managed loblolly pine forests. Topics addressed in these studies include responses of small mammal communities, soil characteristics, and water resources.