

# On-Site/Off-Site Impacts of Woody Biomass Operations on Soil and Water Resources: Can NC Deal With Them?

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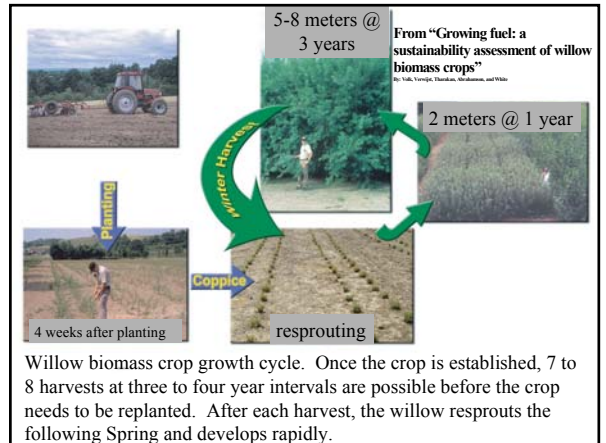
## Presentation Overview

- Clarification of biomass operations discussed
- Potential positive impacts
- Potential negative impacts to soil & water
- Likely ways to mitigate negative impacts
  - BMPs, FPGs
  - Targeted education
  - Informed FM recommendations
- Summary

## What this Presentation Does *Not* Concentrate On

Short-rotation woody crop systems:

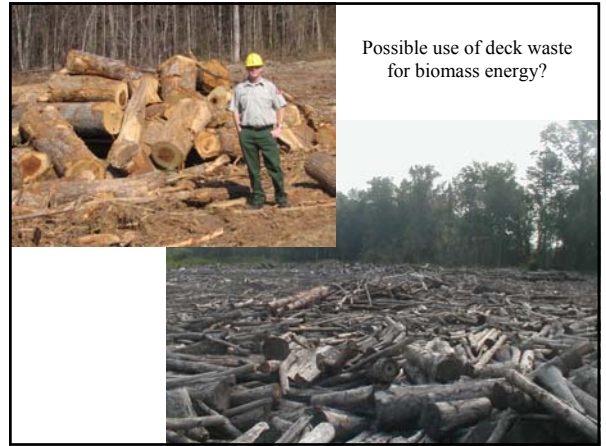
- willow
- sycamore
- sweetgum



## What this Presentation Does Concentrate On

More fully-utilizing woody debris that used to be considered “non-merchantable” during normal forest entries (i.e. thinnings and final harvests).





### Potential **Positive** Impacts from Biomass Operations to Forests/LOs

- May create markets and make it possible for LOs to get thinnings accomplished where they could not before.
- Thinnings that open forest understories may increase access and recreational use of woodlands.
- Cleared understories mean more light, new browse, and good habitat for certain species.
- Open understories will benefit high-value hardwood species that require full sunlight for rapid regeneration and growth.

### Potential **Positive** Impacts from Biomass Operations to Forests/LOs cont.

- Cleaner final harvests mean reduced site preparation costs for landowners looking to reforest. Tendency toward reforesting may ultimately mean greater forest productivity.
- Cleaner final harvests may negate the need for site preparation on some tracts. This may mean that a second entry (by heavy equipment for site prep purposes) may be avoided, thus reducing risk to water quality. It may also mean more "plant-only" prescriptions, resulting in stands with a mixed hardwood/pine component as well as natural seedlings being represented.

### 2000 NC Chip Mill Study

“...wood harvests for chip mills are well integrated with and not isolated from harvests for other wood products. Although harvests for chip mills may encourage higher utilization of fiber on harvested sites, harvests that include a chip mill component appear to have relatively few effects on soil and water that are qualitatively distinct from those associated with harvests of wood for other industrial wood products.”

From "Economic and Ecologic Impacts Associated with Wood Chip Production in North Carolina-Executive Summary of the Results of the Study" 5-19-2000

**Mean values of downed woody debris on sites with and without a satellite chip mill component:**

Debris Category	W/ Chip Mill Component (cubic feet/acre)	W/Out Chip Mill Component (cubic feet/acre)
Fresh Coarse (>4" diam.)*	406	844
Fresh Fine (1-4" diam.)	428	444
Fresh (>1" diam.)*	834	1,288
Old (>1" diam.)	141	183
<b>Total (&gt;1" diam.)*</b>	<b>975</b>	<b>1,471</b>

\* Differences statistically significant at the 10% level

Information from "The Effect of Satellite Chip Mills on Post-Harvest Woody Debris" 7-27-2000 by G. Hess (NCSU) and D. Zimmerman (U. of Iowa)

**Potential Negative Impacts to Soil and Water Resources**

- Continued removal of fine & mid-size woody debris may lead to reductions in sites' nutrient levels over a period of decades.
- More thorough removal of woody/brushy debris could lead to exposed soils more susceptible to raindrop impact and erosion. *This may be particularly true on sites where leaf litter layer is minimal or missing.*

**Potential Negative Impacts to Soil and Water Resources cont.**

- Excessive removal of smaller trees along Streamside Mngt. Zones (SMZs) could cumulatively affect temperature of water.
- Creation of biomass market may encourage more thinnings/forest entries in areas that traditionally see fewer operations. Ex. Mountains of NC  
This increase in frequency/intensity of forestry operations could lead to greater potential for water quality problems.

**Likely Ways to Mitigate Negative Impacts**

**Nutrient reduction issue:**

- Monitor with soil/foliar sampling.
- Fertilize in traditional manner as needed.
- Reference "EPRIDA" presentation on Tuesday for a closed loop system that transforms woody biomass into a combination of a restorative high-carbon fertilizer, a high-energy green diesel fuel, and one that is carbon negative, i.e. stores more long-term carbon in the soil than is released.
- Target forestry professionals (foresters, loggers, etc.) working with biomass operations and stress the need for them to help educate landowners (LOs) about the need to monitor nutrient levels.

- Would be fairly simple to provide LOs with literature addressing general nutrient loss issues.

Example:



- Could also create a targeted "Biomass Harvest" handout that addressed the nutrient loss concern but also highlighted some of the critical BMPs to use to protect water quality.

**Forestry Best Management Practices (BMPs)**

BMPs are methods or tactics that help ensure water resources are protected during forestry operations. Examples include:

- Streamside Management Zones (widths can vary)
- Waterbars and Rolling Dips
- Other water diversion devices
- Properly-installed Stream Crossings

BMPs are *voluntary*.

Different site conditions call for different BMPs to be used.

## Results of 2000-2003 NC BMP

Report on  
DFR WQ  
website

### Implementation Surveys

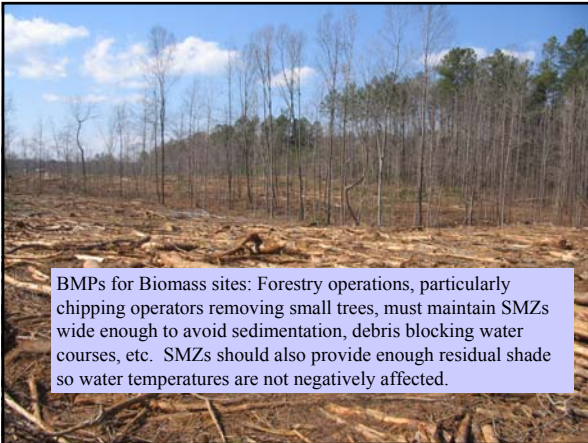
Three-year statewide survey of 565 active logging sites by DFR. Report assesses BMP usage and has recommendations for improving use of and education about BMPs.

- Overall statewide BMP implementation rate = 82%
- By Region: Coast 85% Piedmont 87% Mountains 69%
- BMP Implementation was higher when:
  - Logger/operator had formal BMP training (ex. ProLogger)
  - Technical assistance was provided by forestry professionals
  - Harvest activities were supported by a pre-harvest plan
  - Harvesting was done on gentler slopes
  - Sites were being intensively vs. passively managed

## BMPs for Sites with a Biomass Component

As the 2000 Chip Mill Study reported, harvests with a biomass component are not necessarily *that* different from “regular” forest entries. Depending on the conditions, certain BMPs may simply need to be stressed more:

- Stress pre-harvest planning/ID of waterbodies to protect
- Be very aware of necessary SMZ widths
- Monitor weather/soil conditions and if necessary alter the use of heavy equipment in order to protect litter layer



BMPs for Biomass sites: Forestry operations, particularly chipping operators removing small trees, must maintain SMZs wide enough to avoid sedimentation, debris blocking water courses, etc. SMZs should also provide enough residual shade so water temperatures are not negatively affected.

## Forest Practice Guidelines (FPGs)

### Related to Water Quality

- The NC Sedimentation Pollution Control Act was passed in 1973. Purpose=prevent sedimentation from reaching streams through installation/maintenance of control measures during site disturbing activities.
- Agriculture & Forestry initially had blanket exemptions.
- 1974: Forest Practices Act committee determined Forestry not a major contributor of sediment and recommended voluntary guidelines be developed/followed. They were used until the end of 1989.

## Forest Practice Guidelines (FPGs)

### Related to Water Quality

- 1989: NC Legislature amended SPCA; Forestry kept their exemption only as long as they were in compliance with the FPGs
- 9 FPGs became mandatory for NC forestry operations 1/1/1990
- Forestry operations must comply with FPGs or face enforcement action and/or full permitting guidelines of NC's Sedimentation Pollution Control Act (SPCA) of 1973
- FPGs are *performance-based* standards. Compliance is judged by the “bottom line”, not the techniques used to get there.

## Nine FPG Performance Standards

- .0201 Streamside Management Zones
- .0202 Debris Entering Streams
- .0203 Access Road & Stream Crossings
- .0204 Access Road Entrances
- .0205 Prohibition of Waste
- .0206 Pesticide Application
- .0207 Fertilizer Application
- .0208 Stream Temperature
- .0209 Rehabilitation of Project Site

## When are FPG Inspections Conducted?

- During routine forest management work
- Random logging checks (target active operations)
- Respond to citizen complaints
- If costshare is involved



- Aerial reconnaissance flights

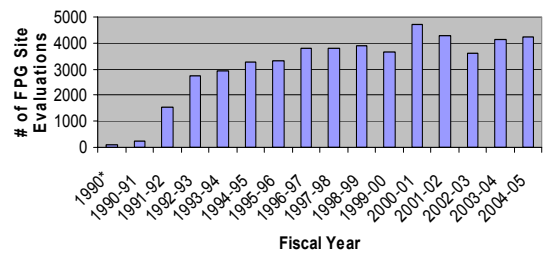


- Monthly if possible; Locate & visit w/in 3 days
- Emphasize active operations, potential problem sites
- Also conducted during fire control, pest control flights

## Summary of FPG Findings from FY 04-05

Total Forestry Sites Inspected	4,241
Sites in FPG Non-Compliance	229
Overall FPG Compliance Rate	95%
Site Re-Inspections	2,042
Referrals to Other Agencies	11
Citizen Complaints Handled	117

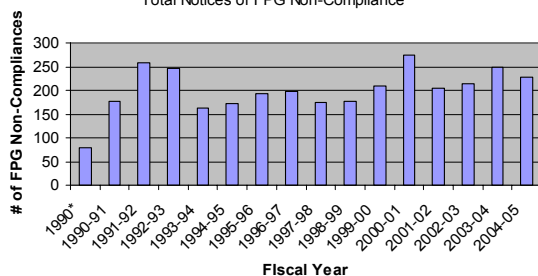
FPG Site Evaluations by Fiscal Year



\*FPGs became mandatory in NC 1/1/1990

NOTE: Above numbers do not include FPG "Re-Inspection" exams

Total Notices of FPG Non-Compliance



## FPG Timeframes

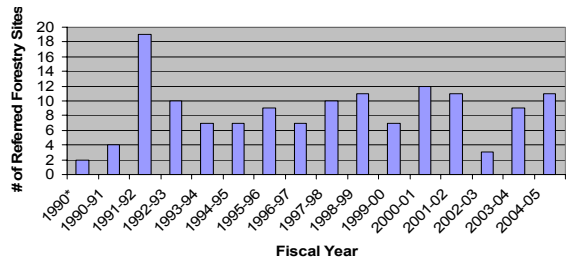
- Respond to citizen complaints-5 working days
- Follow up to violations-3 working days
- Time to bring into compliance-"reasonable"
- Follow up compliance check-1 day after deadline
- Referrals-5 working days following deadline

## FPG Violation Referrals

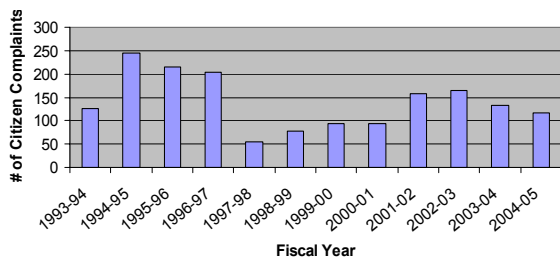
- Development/Sedimentation-DLR
- Fert./Temp./Oil or HazMat spills-DWQ
- Channel blockage-DFR Law Enforcement
- Wetlands (?? Roads, Significant Drainage)-COE, DWQ
- Pesticides-NC Dept. of Agriculture Board



Total # of Forestry Sites Referred to Other Agencies



Number of Citizen Complaints Handled by NC DFR



## Logger/LO Education & Outreach in NC

- NC DFR, NC Forestry Association, Forest Industry reps support ProLogger Programs; Industry monitors BMP usage through its Sustainable Forestry Initiative process

Plan Type	# of Plans	Acres Affected
Pre-Harvest	138	9,987
Fertilization	18	1,403
Pre-Com. Thinning	54	1,905

FY 04-05 DFR accomplishments; does not include thousands of other types of mnegt. plans

- DFR conducted 101 Water Quality presentations reaching over 1,612 attendees during FY 04-05

Forestry community can identify “issues” associated with Biomass Operations and 1. Train foresters to make good recommendations on the front end and 2. Train loggers to make good operational decisions during forest entries

## Make the Right Harvesting Combination Recommendation

Should a biomass component of a harvest be recommended to a LO?

Consider:

- Site limitations (slope, soil type, etc.)
- If LO desires residual woody material in understory
- What wildlife species is being managed for? Will reduction in woody debris benefit/harm them?

## Summary

Can NC mitigate the potential negative impacts from biomass operations to soil/water resources?

I believe so if we make an effort to address “the issues”:

- Ensure LOs are aware of biomass issues (ex. potential nutrient reductions) and help them understand how to monitor their soils
- Ensure biomass operators are aware of the need to stress certain BMPs (ex. sufficient SMZs widths)
- Stress the retention of intact litter layer & avoid exposure of soils
- Combine education efforts with FPG inspections, particularly on sensitive sites
- Tailor harvesting recommendation to site limitations, LO objectives

Thankyou for your time



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