Biomass Harvesting Guidelines Implementation: Challenges and Opportunities, Including Inventory Techniques

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Review - What are BHG's?

BHGs are "Biomass Harvesting Guidelines"

Who Has Them?

- Kentucky
- Maine
- Michigan
- Minnesota
- Pennsylvania
- Missouri
- South Carolina
- Wisconsin
- Forest Guild
- Forest Stewardship Council
- Sustainable Forestry Initiative
- Others?

Most Frequently Heard Comment

BHGs? Why do we need BHGs? We already have BMPs and they are working just fine!

Then, Why Do They Have Them?

- **Rapid increase in woody biomass use creating concerns about overharvesting debris**
- **Concerns about accelerated erosion, loss of nutrients and soil carbon, and ……**
- **ESPECIALLY loss of critical components of wildlife habitat**
- **States added to already in-place water quality BMPs**
- **They are *guidelines*, not mandatory**

Common Provisions *Different* from Water Quality BMPs

- **Dead and downed (or "down") wood retention**
- **Snag retention**
- **Sensitive areas**
- **Wildlife and plant biodiversity**
- **Maintaining soil productivity**
- **Silvicultural operations**
- **Disturbance**
- **Biggest focus is debris retained as down wood!**

BHG Provisions for Down Wood

- **Some specify percentage goals for retained down wood**
- **Some specify minimum tonnage goals for retained wood**
- **Some recommend scattering debris**
- **Some recommend debris piles**
- **But, in all cases, the overall goal is "leave more"**

What is Down Wood?

- Mostly logging residues not collected
  - Coarse woody debris (CWD) >4 or 6" dia.
  - Fine woody debris (FWD) <4 or 6" dia.
- Tops, limbs
- Non-merch. trees
- Already dead wood

Why is Down Wood Important?

- **WILDLIFE: nesting, feeding, predator avoidance, thermoregulation, avoiding desiccation**
- **REDUCING EROSION: physical resistance to flow**
- **SITE PRODUCTIVITY: carbon and nutrient source**

Operational BHG Implementation in Georgia and North Carolina

Developing Research-based Biomass Harvesting Guidelines to Improve Sustainability of Harvesting Woody Biomass for Renewable Energy

Study Objectives

- Determine effects of BHGs on:
  - Mice, shrews, reptiles, amphibians
  - Birds and arthropods
  - Soil properties
- Assess feasibility of BHGs
  - Interview loggers/foresters/landowners
  - Estimate operational costs
  - Deploy BHGs in operational setting
- Inform stakeholders of results

Treatments

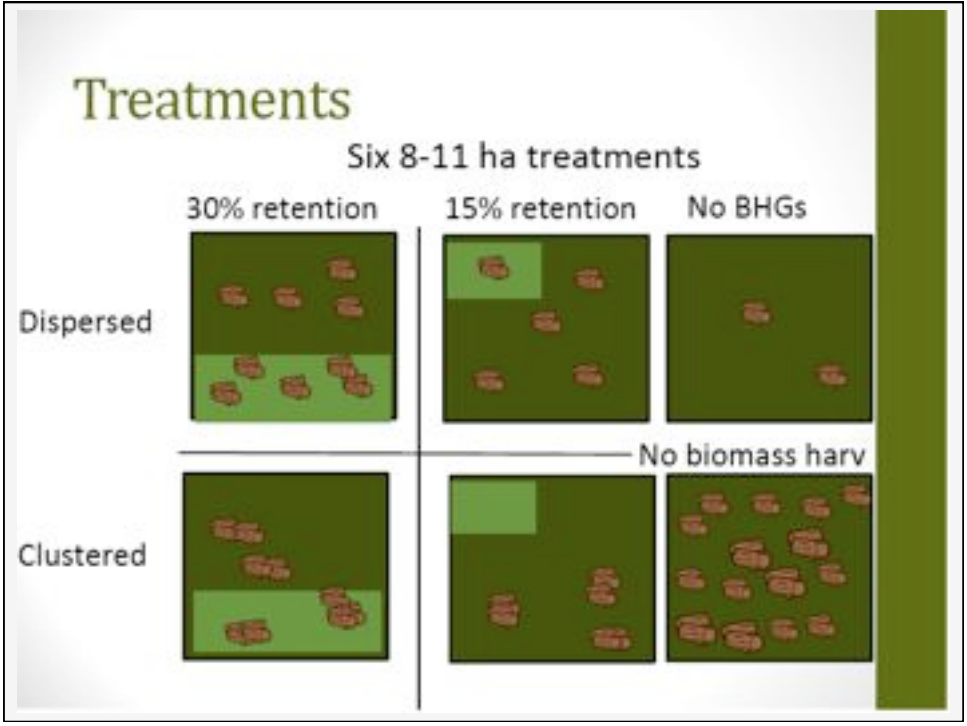
- 8 replicates of 6 treatments across 2 states
- Treatments on forest industry lands
- All treatments in each of 8 clearcuts:
  - No biomass harvest
  - Leave 30% of merchantable biomass in piles
  - Leave 30% of merchantable biomass dispersed
  - Leave 15% of merchantable biomass in piles
  - Leave 15% of merchantable biomass dispersed
  - Biomass harvest with no BHGs

The Sites in North Carolina

- **Managed loblolly pine plantations (age 30+) on industry land (Weyerhaeuser) in the lower Coastal Plain**
- **Large pines with small to medium-diameter soft hardwoods**
- **Pine limbs stripped off where felled by skidders**
- **Hardwoods severed and bunched by cutter and skidded to log deck for chipping along with pine tops**

So, The Big Question – How Will We Implement the BHGs?

- **Return a grapple load of tops, limbs, and small trees from the deck to the site every 3rd or 5th turn?**
- **Have the cutter build separate bunches of hardwoods for chipping vs. pulpwood?**
- **Company Logging Supervisor suggested retention area approach**

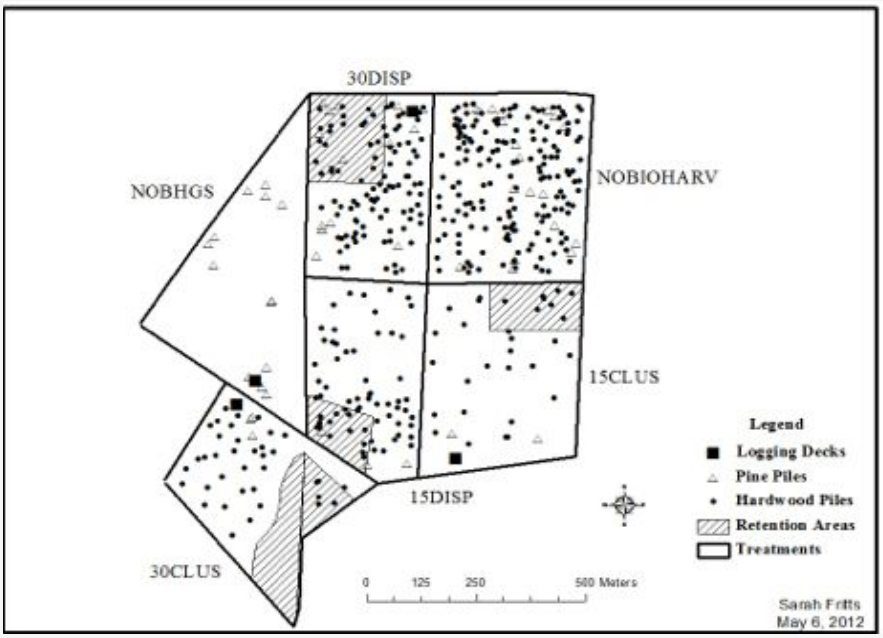


Logging

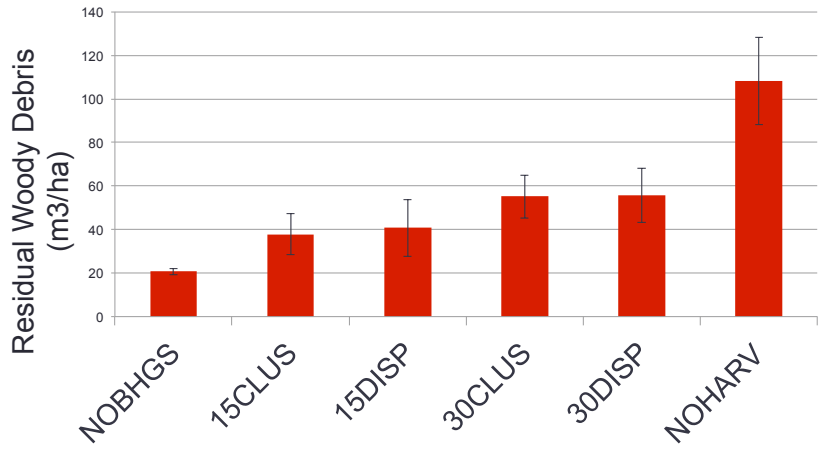
Retention Debris Clustered

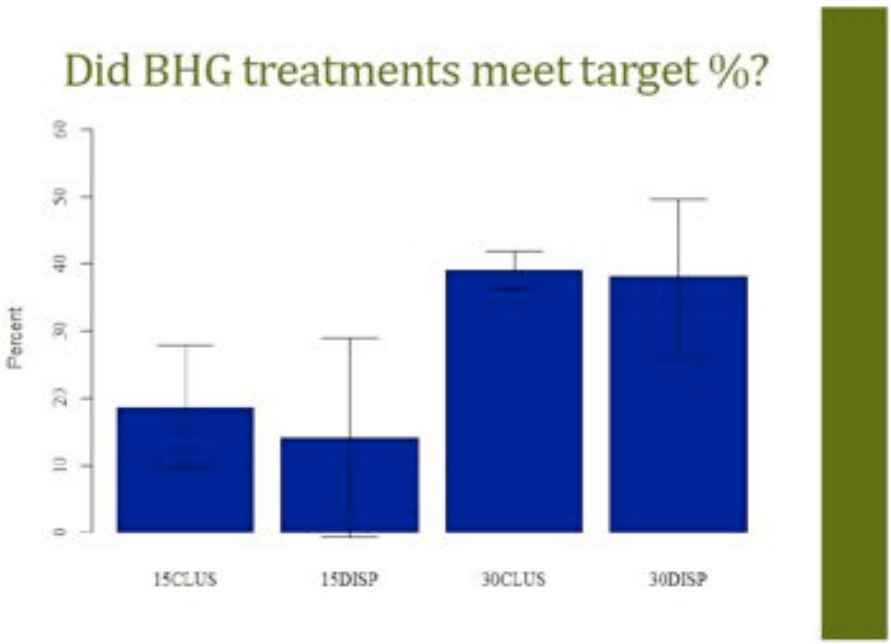
Retention Debris Scattered

No BHG Treatment



Residual Debris Volume (NC)





(to loggers) "How difficult was it cutting and scattering debris to be left?" (1 response)

- "It was really not too bad."
- "A good logger cuts down everything anyway" with the cutter."
- "It makes things easier for the site prep guys plus most landowners like it all down."
- "Spreading out the stems takes some time, but it was not too bad."

"How difficult was it cutting and scattering debris to be left?" (second response)

- "No, it really was not that bad – just a little extra work, but it was not too bad."

(to logger) "How do you think retention should be accomplished?"

- "We could probably do whatever is required, but here is what I think. The best way to leave biomass is on a percentage basis. I don't know what 6 tons per acre looks like, but a percentage could be left easy enough. How would that best be done? Just like you guys did it. Mark off the percent by area and leave that stuff. It does create some work and expense that we have to bear in carrying that stuff over the whole track."

Issues and Concerns

- Retention area approach may not work for variable structure stands
- Retained debris may not make sense if site prep to be done
- If debris is to be retained as clusters, some site prep will rearrange clusters
- WHO WILL PAY FOR BHGs and WHAT WILL BE THE COSTS?

Concluding Thoughts and Comments

- **The retention goals were achieved**
- **Loggers felt the techniques was not too burdensome, but……**
- **It did come at a cost, although that cost was not measured**

Forest Harvest Residues

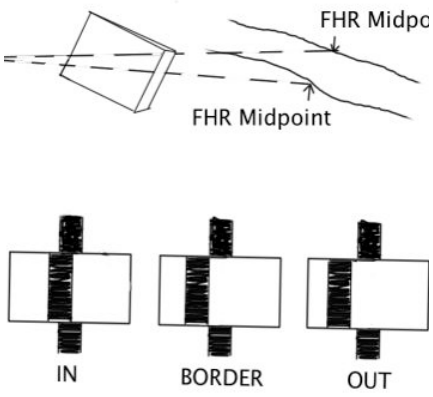
Scattered Residues

Piled Residues

Sampling Forest Harvest Residues

- Prism sweep (Bebber and Thomas, 2010)
- Slash pile sampling (adapted from Woodall and Monleon, 2007)

Prism Sweep Sampling



Play PSS vid

Play PSS Video

Prism Sweep Sampling Limitation

Must have clear sight line

Scattered material can not be layered on site

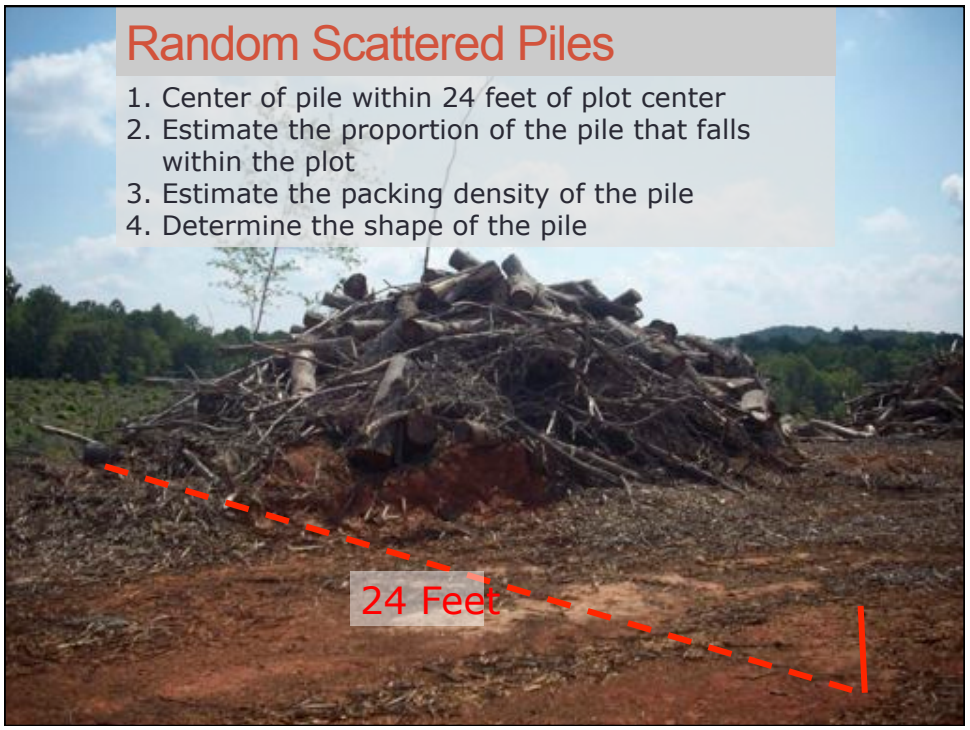
Prism Sweep Sampling Limitation

- Works best for larger piece size
  - Misses some smaller diameter material depending on how high the prism is held
  - small pieces can more easily be hidden under a close large piece or under soil or forest floor

Slash Pile Sampling

Random Scattered Piles

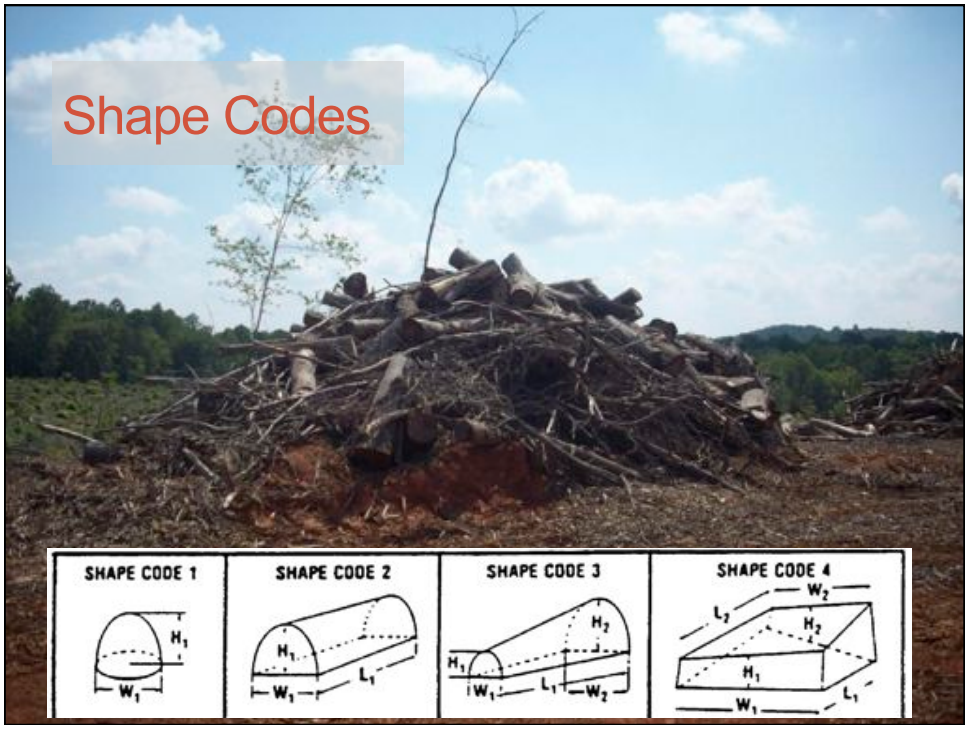
1. Center of pile within 24 feet of plot center
2. Estimate the proportion of the pile that falls within the plot
3. Estimate the packing density of the pile
4. Determine the shape of the pile

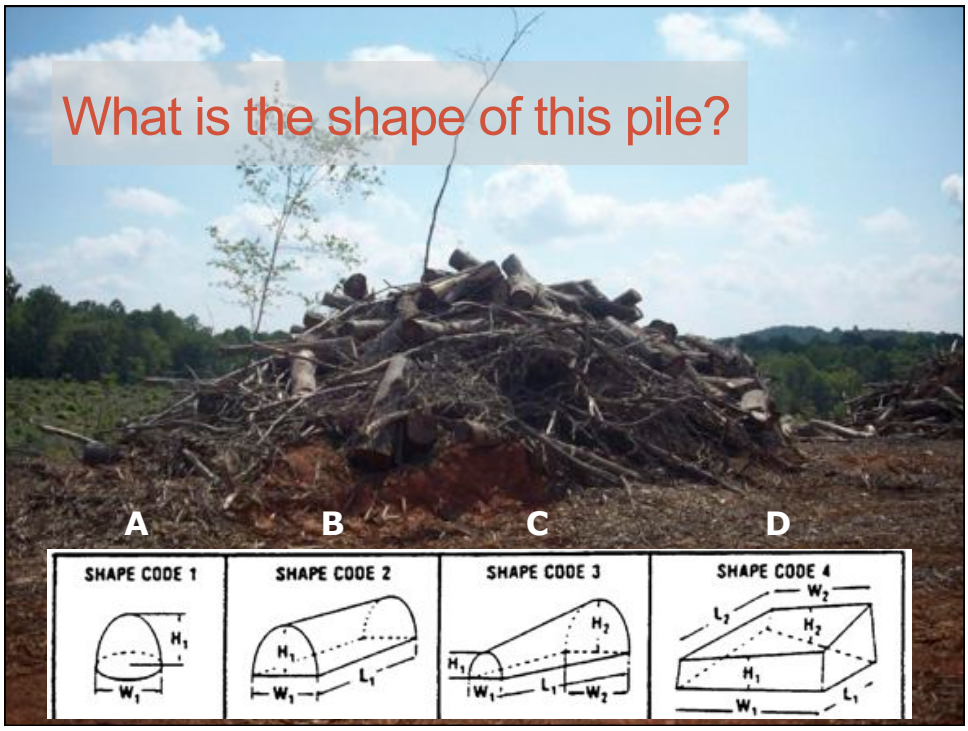


Packing Density

- Is a measure of the density of the pile considering the amount of wood and airspace
- The proportion is between 0 and 1

Shape Codes




What is the shape of this pile?
A
B
C
D
SHAPE CODE 1
SHAPE CODE 2
SHAPE CODE 3
SHAPE CODE 4


Shape Code 1


Width


Height

If the piles are systematic across the site

- Measure all piles

For more information

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- For woody biomass see:
  - http://www.ces.ncsu.edu/forestry/biomass.html