USFS Strategies for Measuring Low-Valued Roundwood and Biomass



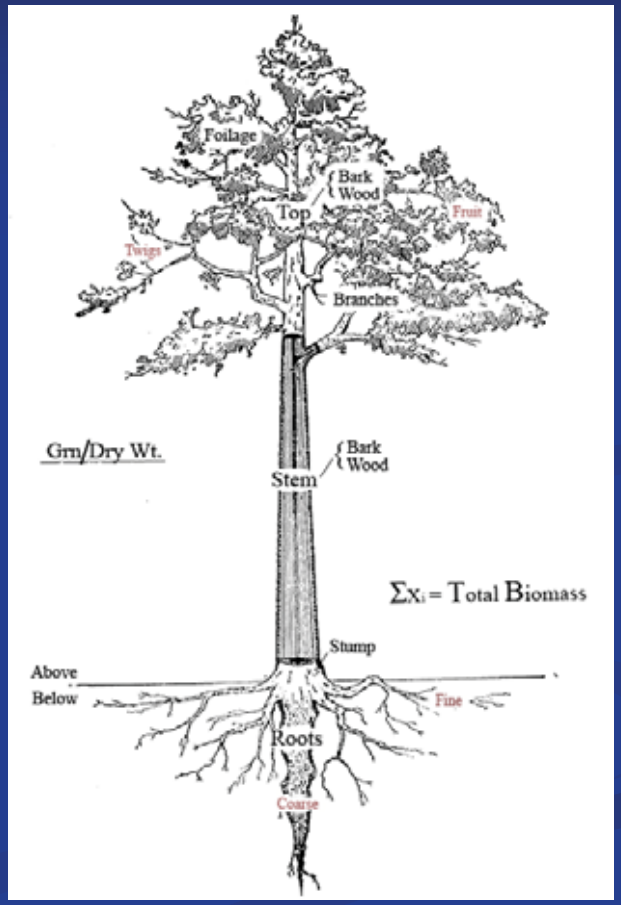



Woody Biomass Utilization

- In June of 2003, a MOU was signed by the Secretaries of Agriculture, Energy, and Interior.
- Promoted Woody Biomass Utilization for Restoration and Fuel Treatments.
- Established eight policy principles
- How do we quantify biomass?

What is Woody Biomass?

- Means different things to different people.
- Above Ground Woody Biomass componentized into:
  - Stump
  - Main Stem
  - Top
  - Branches
  - Foliage
  - Bark

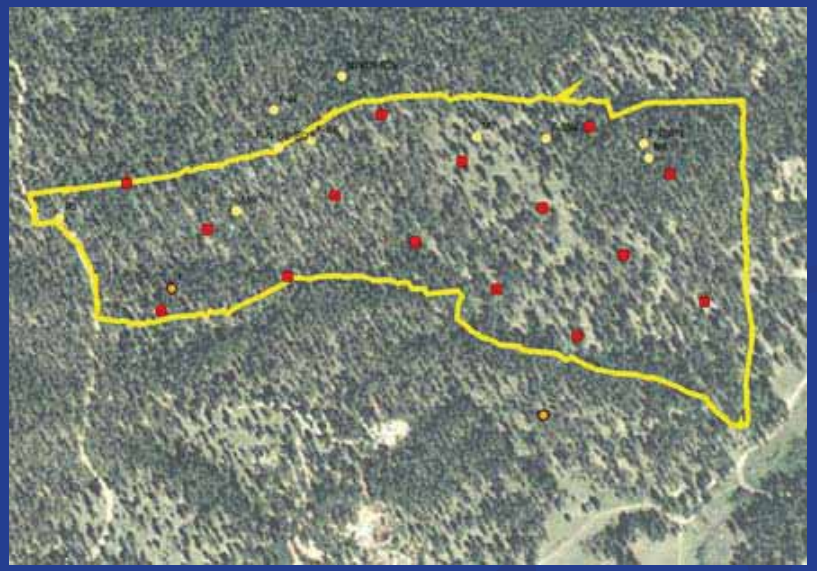


How to Cruise for Biomass

- Need to know how much is there
- Currently low valued or negative value
- Need low cost estimates
- Evaluating
  - 3P – Remote Sensing Method
  - Pile Estimation
  - Fix-Count

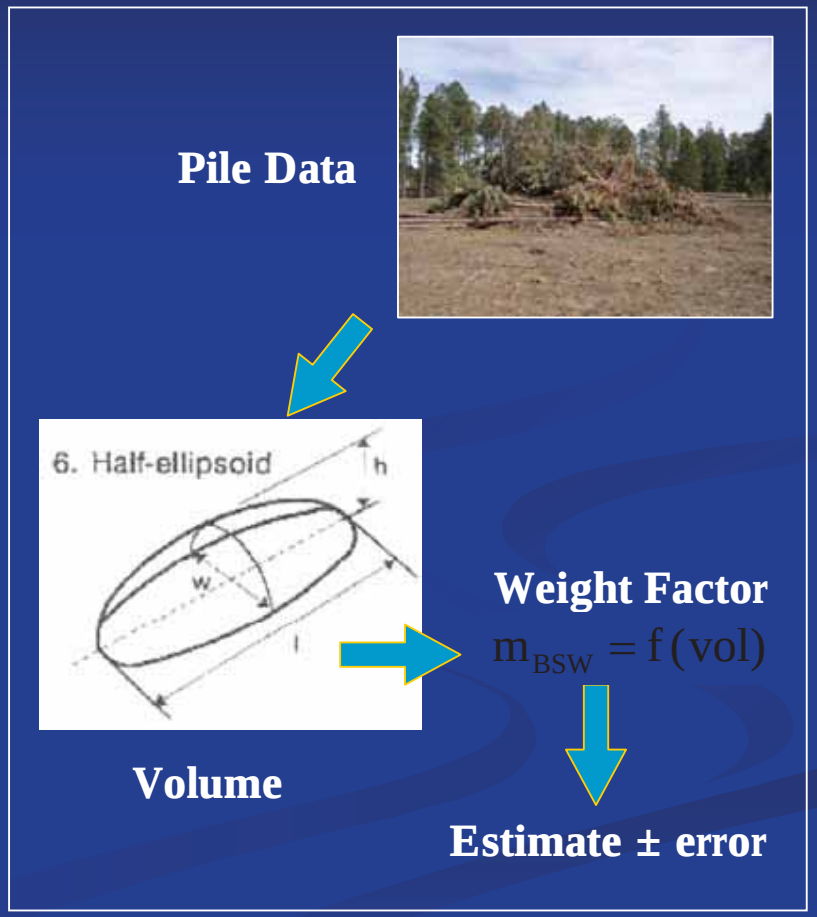
3P Remote Sensing

- Using aerial photography:
  - Establish plot on photo
  - Estimate volume at each point
  - Using 3P sampling, select a portion of those plots to visit on the ground
- Total biomass estimate
- LIDAR will improve efficiency



Pile Estimation

- Estimate area of the pile
- Add compaction ratio
- Multiply by weight factor
- Calculates the total biomass in the pile



FIX-COUNT

- Fixed plot method
- Trees are tallied by species and Diameter class
- Diameter only biomass equations
- Trees per acre
- Tons per acre

Biomass Equations

- Developing National Biomass Estimator Library
- Promote inter-agency consistency
- FMSC collaborating with FIA
  - Standardize component biomass definitions
  - Retrieve relevant equations and associated metadata
  - Identify gaps
  - Provide guidance in the development of future estimators
  - Provide guidance in the validation of existing estimators

Validation

- Select sample trees
- Measure biomass
- Compare to biomass equations
- Several measurement procedures
  - Whole Tree
  - Ratio Estimator
  - Randomized Branch with Importance Sampling

Whole Tree

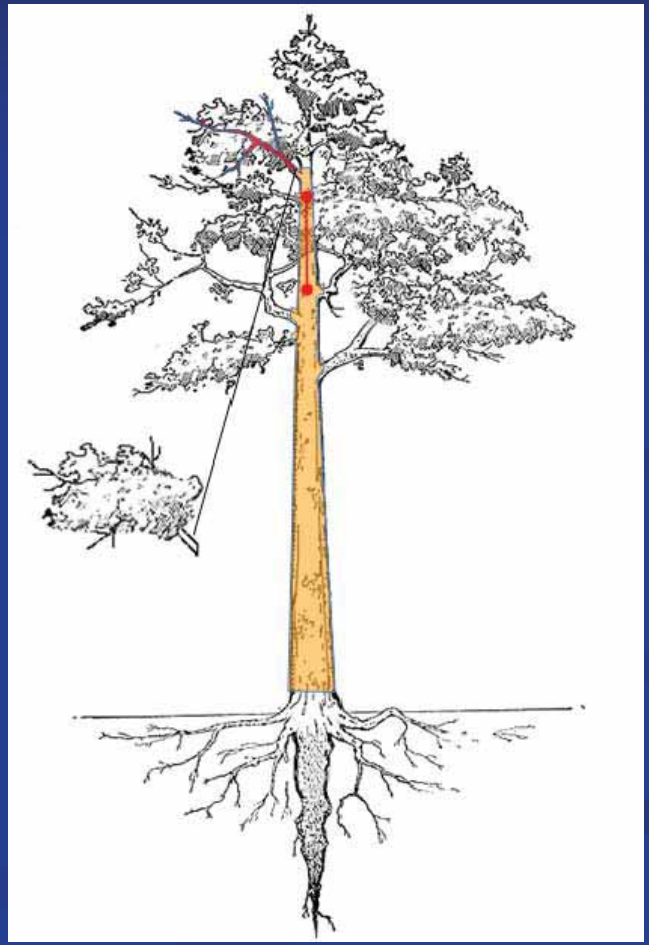
- Fell the tree
- Divide the tree into relevant biomass components
  - Main Stem
  - Crown
- Weigh the components
- Not the best for foliage or bark weights

Ratio Estimator

- Fell Tree and weigh main stem
- Divide the crown into strata (3)
- Select a sample of branches from each strata
- Weigh the branches of each strata
- Divide the sample branches into biomass components and weigh components
  - Foliage
  - Bark
- Component weights are expanded back to the crown using ratio estimator for each strata

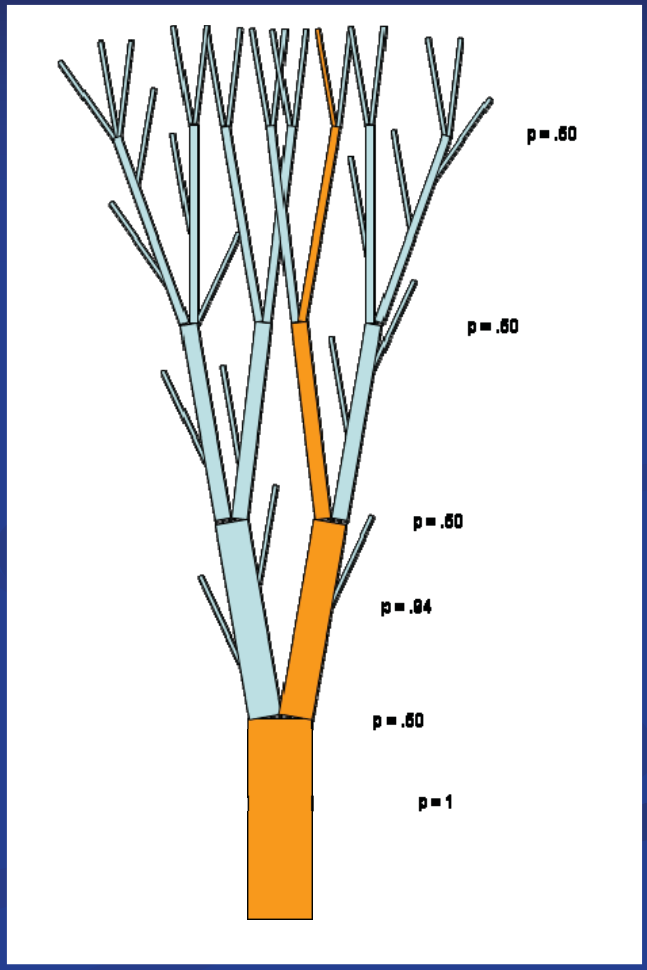
Randomized Branch Sampling

- Develop by Jessen (1955) for estimating fruit counts on trees
- Fell the tree
- Select a branch as follows:
  - Measure the diameter of the branch
  - Measure the diameter of the main bole at the same location
  - Sum the squares of the diameters
  - Draw a random number between 1 and the sum of square diameters.
  - Select the branch or the main bole



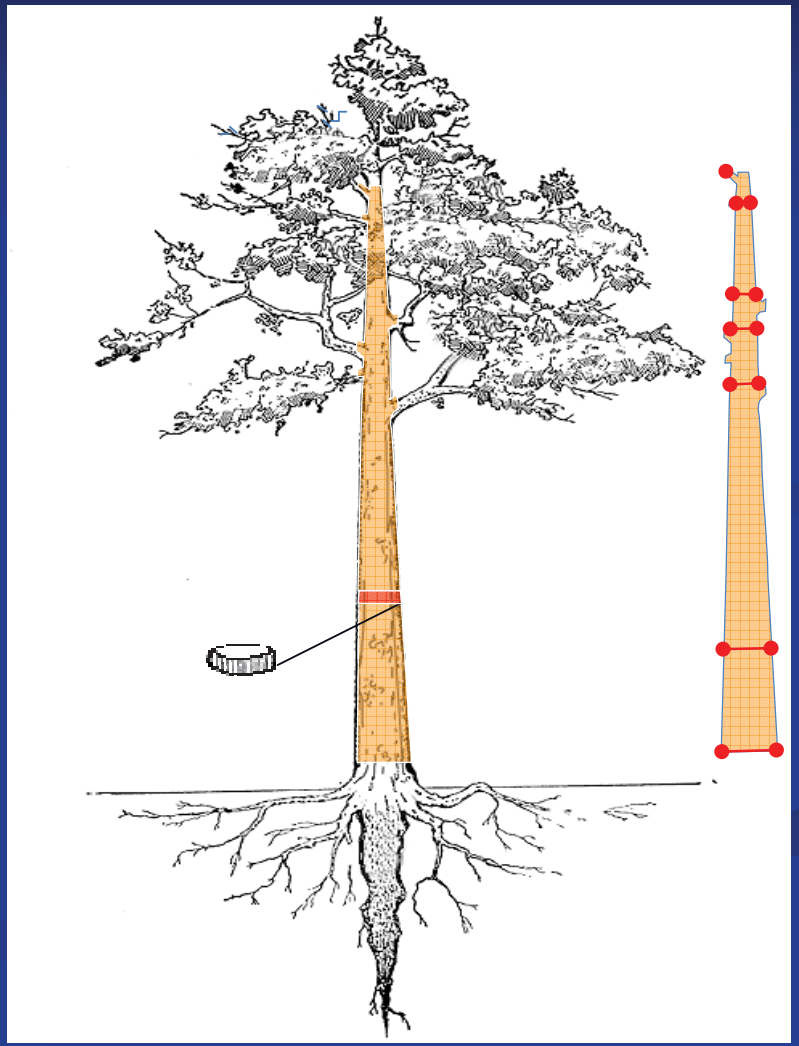
Randomized Branch Sampling

- Select a branch as follows:
  - If the main stem is selected, move to the next branch
  - If the branch is selected, remove the branch, divide the branch into components and weigh the components
  - The branch components are expanded back to the tree by using the product of the probabilities



Importance Sampling

- Develop by Valentine et al. (1984) for estimating tree biomass, volume and mineral content (C) in trees
- Select a pie cut from the main stem using importance sampling based on volume
- Determine the weight and volume of the pie
- Expand the weight by volume of the main stem.
- Can be used to get moisture content
- Can be used with Ratio or Randomized Branch Sampling to determine main stem weight



Questions