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MANUAL TRANSMITTAL SHEET

Subject: Release of Timber Measurement Manual 5300

1. Explanation of Material Transmitted: This manual release updates timber measurement policies to incorporate business practices that have developed due to technology changes and the need to adapt to significant event such as large wildfires, severe drought, and acute insect and disease events that impact timber measurement.
2. Reports Required: N/A
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Chapter 1. Overview

1.1 Purpose

This manual section provides the Bureau of Land Management (BLM) policies and guidelines for measuring timber.

1.2 Objectives

The objective of this program is to establish and maintain a timber measurement system.

1.3 Authorities

- A. Federal Land Policy and Management Act of 1976 (90 Stat. 2743).
- B. The Act of August 28, 1937 (50 Stat. 874, 43 U.S.C. 1181a).
- C. Material Disposal Act of 1947 (61 Stat. 681).
- D. Title 43 CFR Subparts 5420 and 5422.

1.4 Responsibility

- A. The Directorate. The Assistant Director, Resources and Planning has overall responsibility for comprehensive timber measurement programs.
- B. The State Directors. Each State Director has responsibility for the following:
 - 1. Establish and conduct the BLM timber measurement program within his/her area of jurisdiction.
 - 2. Issue manual supplements, which describe or define the timber measurement program.
 - 3. Obtain approval of the timber measurement program with the Assistant Director, Resources and Planning prior to issuance of manual supplements.
 - 4. Advise the Assistant Director, Resources and Planning of timber measurement needs and problems.

- C. The Oregon State Director. In addition to the preceding, the Oregon State Director is responsible for the following measurement activities in Oregon and Washington:
1. Develop and design new timber measurement methods and procedures.
 2. Coordinate timber cruise and log scale electronic data processing.
 3. Recommend policy changes or major procedural changes concerning timber measurement to the Assistant Director, Resources and Planning.
- D. The District Manager. Directs timber measurement in accordance with the policies and guidelines in this manual section and any other supplemental instructions issued by the state director. Specific responsibilities include:
1. Providing cruising, and when needed, scaling training for forestry personnel.
 2. Ensuring, through staff assignments, that District timber measurement performance is monitored effectively for accuracy.
 3. Requesting technical assistance from the state director or his/her designee when timber measurement problems become apparent.
 4. Ensuring that qualified personnel direct the measurement of BLM timber.

1.5 References

- A. (Reserved)

1.6 Policy

Timber on BLM forestlands covers a wide spectrum of species, stocking densities, products and values. Because of this diversity, it is impractical to establish a national BLM timber measurement program. Rather, regional timber measurement programs, developed at the state office level, must be established to fulfill BLM needs.

- A. Timber measurement must be accomplished in accordance with procedures and guidelines contained in the state timber measurement program established by each respective state director.
- B. The same timber measurement and grading standards must be used to cruise trees and scale logs to eliminate any conflicts between the two measurement methods.
- C. Individual state timber measurement programs must be established to satisfy the measurement needs within each state director's jurisdiction. Collaboration between

states with similar measurement needs is encouraged. At a minimum, each timber measurement program must consist of the following six parts.

1. Timber Products. See Chapter 2.
2. Volume Equations. See Chapter 3.
3. Timber Measurement Systems. See Chapter 4.
4. Accuracy and Sampling Guidelines. See Chapter 5.
5. Merchantability Guidelines, Grading Rules and Deductible Defects. See Chapter 6.
6. Timber Measurement Qualifications. See Chapter 7.

1.7 File and Records Maintenance

Timber measurement records will be managed in accordance with established records retention and disposal policies. Refer to BLM Manual 1220, Records and Information Management, for policies and procedures. See the General Record Schedule for information on the disposition of records.

Chapter 2. Timber or Wood Products

Each State Director issues an approved list of forest products under Manual Supplement 5300. States having tree and/or log grades for forest products are not required to issue an industrial forest products list.

2.1 Units of Measure

These include but are not limited to: sawtimber, marginal logs, post and poles, pulp wood, and biomass.

- A. Dimensions. Use timber products dimensions that are standard for the respective products.
- B. Units of Measure. Use any of the following units of measure.
 1. Number
 2. Lineal feet
 3. Board feet - The Scribner 16-foot board foot measure is used to appraise and sell timber.
 4. Cubic feet
 5. Cords
 6. Tons
- C. Unit of Conversions. Provide conversion factors to convert units of measurement to board feet.

Chapter 3. Volume Equations

Each State Director shall approve a cruising program such as BLMCruiser or FSCruiser, which incorporates regional specific volume equations from a national volume library. Development of local empirically based volume tables may also be approved under the 5310 (cruising) and 5320 (scaling) Manual Supplements.

3.1 Sources

- A. Cruising. The BLM developed volume equation tables for use with BLMCruiser in the Pacific Northwest. When using FSCruiser, users should select the nearest National Forest and its respective USFS Region in order to apply the correct volume equations.
- B. Scaling. BLM total taper log scale tables are appropriate for use throughout BLM.

Chapter 4. Measurement Systems

The Assistant Director of Resources and Planning approves all BLM measurement systems including software. The State Directors may approve any subset of the approved measurement systems appropriate for their respective states. Common measurement systems include but are not limited to the following.

4.1 Timber Cruising

- A. 100% Cruise
- B. 3P Sample Cruise
- C. Variable Radius Plot Sample Cruise
- D. Fixed Area Plot Sample Cruise
- E. Strip Sample Cruise
- F. Sample Tree Cruise
- G. Other Estimation Methods. There are circumstances such as when site hazards make it unsafe to enter the stand or product values are exceedingly marginal where the forester may seek line officer approval to use professional judgment to estimate product volume. Other estimations methods appropriate under special circumstances include but are not limited to: ocular, light detection and ranging (LiDAR), photogrammetry, remote sensing, and modeled or empirical data.

4.2 Timber Scaling

- A. 100% Log Scale
- B. Sample Load Scale
- C. Sample Weight Scale
- D. 100% Weight
- E. Load Count

Chapter 5. Accuracy and Sampling Guidelines.

The BLM goal for timber measurement is to provide volume estimates with summary statistics that are useful to the BLM, the end user, and guided by cost-benefit considerations. The state director may establish accuracy standards if needed. Due to the variability in timber and forest product values across the BLM, it is not practical to establish BLM wide accuracy standards. When considering whether a cruise or scale design is sufficient, follow these guidelines.

5.1 Accuracy Guidelines

- A. Sample intensity and labor investment for improving accuracy should consider the value of the timber products and the experience and needs of local purchasers, e.g., how much do the purchasers rely on the BLM cruise for making business decisions versus their own site reconnaissance and experience.
- B. When an office changes the estimation method they commonly use to estimate timber product volume, it is important to highlight the change to purchasers that have been making business decisions based on BLM estimates and their experience of purchasing BLM timber. This can be accomplished in the timber sale notice, prospectus, or other public notice.
- C. Use, dissemination, and publication of volumes for timber product conveyance or sustainable harvest estimates should include methodologies used, summary statistics, and other information related to the data that is useful for understanding the estimates and/or are relevant to the end user.
- D. When timber conditions and circumstances such as defect, variability, and other factors impede achieving relative accuracy, it is important to provide information about the magnitude of volume deviation from the estimate so purchasers can adequately factor the risk.

Chapter 6. Timber Merchantability

Each State Director issues timber merchantability guidelines under Manual Supplement 5300. This is accomplished by identifying deductible defects and merchantability specifications.

6.1 Deductible Defects

- A. Mechanical. Timber merchantability guidelines need to identify deductible mechanical defects (e.g., breakage, sweep, fork, and crook).
- B. Biological. The 5300 Manual Supplement must identify sources of information on the types of diseases which affect timber within the State and the extent of damage, including hidden defect, associated with the rot caused by each disease.

6.2 Merchantability Standards

The following types of guidelines may be included in the 5300 Manual Supplements. The merchantability of each forest product must be established and clearly communicated for each contract and may differ by contract to adjust to site and market conditions.

- A. Species. Identify each forest product species.
- B. Minimum Diameter Breast Height (DBH). Identify the smallest merchantable tree by diameter breast height.
- C. Minimum Top Diameter. Identify the minimum fixed top diameter and/or variable top diameter.
- D. Other Minimum Merchantability Guidelines. Identify the acceptable minimum merchantability specification (e.g., one-third soundness, 16-foot log length).

6.3 Tree or Log Grades

States may require a grading system, which reflects value differences in log or tree grades. Grades developed by other agencies may be used where grades have not been developed within the BLM.

Chapter 7. Measurement Qualification

Individuals who measure timber must have training and experience.

7.1 Training

Personnel who conduct the measurement or estimate of BLM timber must have acquired knowledge and skills in forest mensuration, statistics, and data collection and processing software before working independently.

7.2 Knowledge

Supervisors of personnel with duties requiring timber measurement should work with the state office forestry program lead or personnel assigned to specifically provide technical expertise on timber measurement to ensure competency.

7.3 Experience

Personnel trained in timber measurement should periodically be assigned to timber measurement projects to maintain measurement skills.

Glossary of Terms

3P Sample Cruise: A timber cruise, which combines the 100% cruise procedure with a unique method of sample tree selection and individual sample tree volume determination. In 3P sampling, the probability that a tree becomes a part of the sample is proportional to its predicted volume.

-A-

Accuracy Standard: An acceptable limit or norm within which a timber volume estimate can deviate.

-B-

Breakage: Defect that results from damage during felling, yarding or loading.

-C-

Check Cruise: A timber cruise used as the timber volume standard of comparison to verify the accuracy of another timber cruise.

Chip Logs: Timber used as a source of wood chips for manufacturing paper and pressed wood products, synonymous with pulp logs.

Cruise: A field examination of a forest area to locate timber and estimate its quantity by species, products, size, quality, and/or other characteristics.

Cull Peeler: Timber, which does not meet saw log or peeler log merchantability standards and is used for manufacturing plywood.

-D-

Deductible Defects: Mechanical and/or biological timber defects, which render wood fiber unsuitable for specific timber product uses. Allowances are made to account for timber losses due to such deficiencies.

-F-

Form Class: The ratio of diameter inside bark at the top of the first log divided by diameter outside bark at breast height.

-H-

Hidden Defect: Internal defects that have no visible indicator to provide an indication of the presence or extent of the defect.

-L-

Log Scaling: The estimation of gross and/or net merchantable volume of a log based on a log rule.

-M-

Marginal Log: Timber, which meets sawlog and peeler log size specifications but not merchantability specifications. Timber products in this category include cull peelers, pulp logs and chip logs.

Merchantability Standards: Criteria used to judge the suitability of timber for specific timber products.

-O-

100% Cruise: A timber cruise in which the estimate of volume, by species, is determined from size measurements taken for every tree in the area, which meets established standards of merchantability.

-P-

Peeler Logs: Sawtimber, which meets the merchantability standards for the manufacture of plywood.

Pulp Logs: Timber used as a source of wood chips for manufacturing paper and pressed wood products, synonymous with chip logs.

-R-

Recovery Factor: A percentage, which is applied to timber cruise volumes and sometimes values to account for wood in merchantable logs or trees that is not expected to meet end-product standards, synonymous with defect and breakage factors.

-S-

Sample Cruise: A timber cruise, in which the estimate of total quantity is determined from a portion, or sample, of the trees, which meet established merchantability standards in the forest area or sale area.

Sample Error: The error caused by observing a sample instead of the whole population. The sampling error is the difference between a sample statistic used to estimate a population parameter and the actual but unknown value of the parameter.

Sampling Standards: Criteria used to check for sample bias and to evaluate the reliability of volume and sometimes value estimates obtained from timber sampling.

Saw Logs: Timber used to manufacture lumber.

Scaling Measurement Variations:

- **100% Log Scale** - Actual volume removed is determined by scaling 100% of the logs (loads) removed from the contract cutting area.
- **Sample Load Scale** - A subset of the log loads are scaled and statistically expanded to the entire contract volume based on the number of loads hauled.
- **Sample Weight Scale** - All log loads are weighed and a subset of loads are scaled to determine a weight-to-volume ratio. The final volume is derived from the total weight of all loads multiplied by the average volume-to-weight-ratio of the subset of scaled loads.
- **100% Weight** - All loads are weighed and timber is sold on a per ton basis. For

- reporting purposes a conversion factor of board foot per ton is supplied by the forester.
- **Load Count** – All loads are counted and a subset are sampled to determine a load-to-volume ratio.

-T-

Timber: Trees that can be converted into a useable form through processing and/or manufacturing.

Timber Cruise Report: An array of timber statistics generated from a timber cruise.

Timber Measurement Program: A program, which provides direction, guidance, and support for timber measurement within a given geographical area.

Timber Product: Any material derived from a harvested tree for direct consumption or commercial use, such as but not limited to lumber or paper.

-U-

Unit of Measure: A precisely specified quantity (i.e., board foot, cubic foot, number, lineal foot, tons, and cord) used to designate the volumes of timber products.

-V-

Volume Equation: An equation used to express a tree in terms of a unit of measure based on log characteristics such as:

DBH (Diameter Breast Height)

Form Class (the ratio of diameter inside bark at the top of the first log divided by DBH)

Number of logs per tree

Total height per tree

Scaling diameter

Log length

-W-

Wood Products: Timber and other wood material not normally measured in board feet.