

**Forest Service Handbook
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Forest Service Handbook 2409.13a – Timber Permanent Plot Handbook

Zero Code

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Approved by: F. Dale Robertson, Chief

Date approved:

Responsible Staff:

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Digest: Following is an explanation of the changes throughout the directive by section.

2409.13a: Establishes new Handbook, FSH 2409.13a, Timber Permanent Plot Handbook, outlining direction on establishing permanent plots for sharing of timber growth and yield information. It requires consistent and standard information to be collected on permanent plots that are established for growth and yield modeling.

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This handbook provides direction to personnel who have the responsibility of establishing field plots used to determine timber growth, yield and mortality. Permanent plots can be installed by individuals at all levels of the Forest Service. The purpose of this handbook is to ensure compatibility in the establishment and measurement of permanent plots for determining timber growth, yield, and mortality and to promote sharing of the resulting data between Forest Service units and other groups collecting and reporting growth and yield data.

01 - Authority

The National Forest Management Act (NFMA) of 1976 (16 U.S.C. 472a) requires integrated resource planning and authorizes collection of information needed to prepare the forest plans.

02 - Objective

To provide consistent, compatible, and comparatively reliable growth and yield data and data for use in long term studies of climate change and global warming.

03 - Policy

1. A minimum set of information is required for all plots established to measure and monitor timber growth and yield. The minimum information set shall be complete and consistent across administrative units to provide sharing of data, information, and experiences.

2. Field units shall coordinate the process of establishing all permanent plots used for the primary purpose of developing growth and yield estimates with adjacent units and those at higher and lower organizational levels. Use the plots for information sharing and to provide available and consistent timber growth and yield model information through standard permanent plot procedures.

3. Unless a formal decision is made to abandon plots by the Regional Forester or Station Director continue remeasurements of growth and yield permanent plots as scheduled.

04 - Responsibility

04.1 - Washington Office Staff Directors

The Directors of Timber Management, Forest Management Research, and Forest Inventory, Economics and Recreation Research are responsible for providing and supporting compatible permanent plots guidelines and for permanent plot software used in growth and yield studies.

04.2 - Regional Foresters and Station Directors

It is the responsibility of Regional Foresters and Station Directors to:

1. Coordinate resource monitoring activities within their geographic areas of concerns.
2. Establish and maintain growth and yield permanent plot studies. This authority may be delegated to Forest Supervisors and Project Leaders.
3. Ensure new growth and yield permanent plots are established using the direction contained within this Handbook, and consistent with FSH 1909.14, FSM 2060, and FSH 2090.11.
4. Ensure collection, calculation, and maintenance of information about all growth and yield permanent plot variables that are required in chapter 20.
5. Establish standards for maintaining records of growth and yield permanent plots or stands containing such plots.
6. Designate a permanent plot coordinator to track various plot systems and ensure appropriate recordkeeping.
7. Consult with other Forest Service units for interest and use prior to treatment of areas containing known permanent plots or prior to abandonment of such plots.
8. Utilize permanent plot growth and yield analysis software and databases.

04.3 - Forest Supervisors and Project Leaders

If so delegated, it is the responsibility of the Forest Supervisors and Project Leaders to:

1. Develop an implementation plan prior to establishing permanent plots for determining timber growth and yield.
2. Obtain the necessary statistical reviews of the implementation plan prior to initiation.
3. Approve the implementation plan.
4. Develop and approve activity reports.

5. Maintain and remeasure permanent plots as scheduled.

6. Maintain growth and yield information as appropriate.

05 - Definitions

Attributes (properties). The differentiating characteristics that must be discovered, measured, described, delineated, or derived to fulfill the objectives of the study or inventory.

Cluster. A sampling unit (plot) comprising two or more sample elements or subunits (subplots). The subunits are observed as part of the single primary unit.

Control Variable. A measurement, quantity, or reference that characterizes or describes where or how data are collected and stored.

Destructive sampling. Felling of trees or clipping of vegetation in order to measure them. Example: felling and bucking a tree to obtain wood specific gravity samples along the stem.

FIA plots. Plots installed by the Forest Inventory, Economic and Recreation Research Forest Inventory and Analysis (FIA) units for the purpose of periodically assessing the volume, mortality, cut, changes, and so forth, in these attributes in the forest land base. The plots are used to estimate current stand and future projections for broad categories at the state, regional, or national level. Plots are necessarily permanent and are usually administered by the responsible FIA unit.

Fixed area plot. A sample unit of a given size, usually in fractions of an acre. Example: 0.1 acre.

Forest inventory plots. (Also see FIA Plots). Plots installed in periodic inventories to give estimates of standing volume and its distribution by species, age class, and so forth, on National Forests. Some provision to estimate current growth is usually included. Uses are primarily applicable to local planning units and also to state or national levels. These plots may be permanent, temporary, or temporary with supplemental growth information and are administered by the National Forest System (NFS).

Growth trend data. Growth now occurring in the forest under the current type of management. These data may be used for short-term projections, monitoring development of operationally treated stands, and adjustment of regional growth models, or used as supplemental information for development of growth and yield models. Trend data are also used for conditions represented in the operational forest.

Implementation plan (inventory plan, study plan). A written document indicating in detail how a survey or experiment is to be carried out and how the results are to be generated.

Ingrowth tree. A newly established seedling or a tree that passed the minimum size for measurement since the previous measurement; that is, submerchantable and on plot at first measurement and merchantable and on plot at next measurement.

Monitoring. The periodic measurement or observation of selected physical and biological parameters for establishing base lines and for detecting and quantifying changes over time.

Monitoring plot. A plot installed for measuring or calibrating actual growth of treated stands. The objective is similar to that of research plots but usually limited to one or two treatments; for example, thinned versus unthinned areas. These are usually permanent plots administered by the National Forest System, sometimes in cooperation with Forest Management Research.

Nested plots. One or more plots located within a larger plot with different-sized trees measured on the different-sized plots. Example: a mil acre (for measuring sub-merchantable trees) within a 1/20 acre plot (for measuring pulpwood-sized trees) which, in turn, is within a 1/10 acre plot (on which sawtimber-sized trees are measured).

Nongrowth tree. A tree that was merchantable and off plot in first measurement and merchantable and on plot in next measurement.

Ongrowth tree. A tree not previously measured or previously measured on a smaller plot or with some different sampling probability which has by the time of remeasurement grown enough to be measured on a larger plot or with a different sampling probability; that is, submerchantable and off plot at first measurement and merchantable and on plot at next measurement.

Permanent (remeasured) plot. A plot that is measured in the field at two or more successive occasions to estimate change or to relate change to stand attributes.

Plot. A sample unit or element of known area, shape or probability; for example, variable radius plot.

Purposive sample. A sample in which the individual units are selected by some deliberate means (other than by random or systematic sampling).

Randomly located plot. A plot located according to a procedure that ensures that every location within the population or stratum being sampled has an equal chance of inclusion, independent of the location of other plots.

Reference record. Data recorded for each permanent plot. Each record gives descriptive information from the plot as well as the location of the full set of plot and tree data.

Research plots. (See also FIA plots). Plots installed to develop treatment response predictions for the purpose of prescribing silvicultural or management treatments. These are permanent plots administered by Forest Management Research, often in cooperation with National Forest System.

Resource inventory plots. Plots established to determine the amount of a particular commodity or amenity.

Response studies (response surveys). Planned experiments usually having paired control studies. Response surveys provide a record of ecosystem conditions and changes and quantitative estimates of the observed change that can be attributed to the effect of the specific management treatment or regime.

Standard data interchange format. A pre-defined, fixed format for writing core variables in data files to transmit to requesting units. The format is used to structure permanent plot data for distribution among users.

Stratification. Subdivision of a population into relatively homogeneous groups.

Survey. The act or operation of making measurements for ascertaining the amount and condition of a resource.

Systematically located plot. A plot whose location is determined according to a pre-specified pattern. Example: locating plots at a set interval along transects, with transects located at a set interval apart across a landscape to be sampled.

Temporary plot. A plot that is measured once, where there is no subsequent remeasurement, and is used primarily to estimate current conditions.

Transect. A cross section of an area used as a sample unit for recording, mapping or studying vegetation. May be a series of plots, a belt or strip, or merely a line, depending on the purpose.

Treatment response data. Changes in growth that result from specific treatments applied to defined stand conditions. These data are routinely used for growth and yield models that claim capability of comparing the results of possible alternative treatments or management regimes. Such data generally include treatments or conditions not currently used or found in the operational forest. The data are used for controlled experiments to identify causal relations, define functional forms of relationships, estimate variance-covariance structure and errors associated with estimation, and estimate regression coefficients.

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Trend surveys. Studies that provide historical records of ecosystem conditions and changes over time, including the various outputs associated with the management regime applied. Historical records may include old plot records, survey reports, and so forth.

Variable. Any measured or calculated quantity that is subject to variation. Example: tree diameter at breast height (DBH). Variables may be further classified by the nature of what is being described, see control variable.

Variable radius plot. A plot on which trees are usually selected for measurement with probability proportional to the tree basal area.

08 - References

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