

**Forest Service Manual
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**Forest Service Manual 3200 – Rural and Urban Forestry Assistance
Chapter 3230 - Cooperative Tree Improvement**

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Approved by: Susan M. Super, Acting Service-wide Directive Manager

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Responsible Staff:

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Posting Instructions: This amendment replaces the entire title except Interim Directives (ID's). Place this transmittal at the front of the title; remove previous transmittals. DO NOT remove ID's when posting this amendment. ID's are not being reformatted at this time. Post the documents in the order displayed under New Documents in the following table.

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

3200: This is a technical amendment that converts the format and style of this Forest Service Manual (FSM) title (previously in "Applixware") to the new FSM template using the agency's current corporate word processing software. Where chapters were previously organized into more than one document, they are now merged into one chapter whenever possible.

Although some minor typographical and technical errors have been corrected, this amendment contains no changes to the substantive direction in this title.

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3230.2 - Objective

To provide forest genetics and tree improvement assistance to State Foresters in their efforts to (1) conserve and improve the genetic quality of forests on State and private lands, and (2) produce increased quantities of high quality forest products.

3230.3 - Policy

1. State and Private Forestry shall promote silvicultural practices that maintain or improve the genetic qualities of forest stands. These practices include:

- a. Using silvicultural methods that retain phenotypically superior seed trees and eliminating or discouraging methods that leave phenotypically inferior seed trees.
- b. Using source-identified select seed and planting stock adapted to the environment of the planting sites. As part of this effort, encourage States to maintain the source identity of all forest reproductive material throughout all stages of seed collection, processing, storage, nursery seedling production, distribution, planting, and stand improvement.

2. State and Private Forestry shall promote carefully planned and economically justified tree improvement programs within States and between States. This includes assistance in:

- a. Tree improvement program planning and implementation including selection, testing, and breeding.
- b. Seed orchard design, installation, maintenance, seed harvesting, and integrated pest management.
- c. Development and maintenance of long-term record systems for tree improvement activities.

3. State and Private Forestry shall cooperate with Research, the National Forest System, other Federal agencies, States, universities, and cooperatives in mutually beneficial tree improvement activities.

3230.5 - Definitions

1. Clone. A group of genetically identical plants derived asexually from a single individual.

2. Dysgenic. A practice that is detrimental to the genetic qualities of future generations. Examples of dysgenic forest practices include (a) use of planting stock of unknown origin or maladapted to the planting site or (b) removal of the best trees when harvesting and leaving inferior trees to regenerate the area ("High grading").

3. Provenance-testing. Testing that defines the genetic and environmental components of phenotypic variation associated with geographic source of trees and seed.

4. Phenotype. The plant or character as observed; state, description, or degree of expression of a character; the product of the interaction of the genes of an organism (genotype) with the environment.

5. Roguing. Systematic removal of individuals not desired for the perpetuation of a population.

6. Seed Collection Zone. Zone of trees with relatively uniform genetic composition determined by physiographic or biological data, or preferably by provenance-testing. The area usually has definite geographic bounds, climate, and growing conditions.

7. Seed Production Area. A select stand generally upgraded and opened by removal of undesirable trees then cultured for early and abundant seed population.

8. Seed Orchard. A plantation of trees consisting of clones of seedlings from selected trees, isolated to reduce pollination from outside sources, rogued of undesirables, and cultured for early and abundant seed production. A clonal seed orchard is established by setting out clones as grafts or cuttings. A seedling seed orchard is established from selected seedling progenies. See FSM 3220.5 for definitions of source-identified, select, and elite seeds for trees.

3231 - Program Criteria

3231.1 - State Tree Improvement Plan

States must have a forest tree improvement plan to qualify for Cooperative Forestry tree improvement funds. As a minimum, the plan must provide for minimizing dysgenic forest practices. The plan shall include (1) objectives; (2) necessary improvements, including species priorities, traits, final product estimation and benefit; (3) program intensity levels and resources needed, including manpower, facilities, and funding needs; and (4) proposed work schedules.

3231.2 - Program Priorities

1. Give highest priority to activities that protect and conserve the genetic constitution of forests.

2. Superior tree selection, testing, and associated seed orchard development are also high priority activities but are secondary to the above. Normally, in superior tree selection, give highest priority to criteria associated with superior wood production, followed by improved wood quality, pest resistance, and other considerations.

3231.3 - Silvicultural Systems

It is possible to apply genetic principles in natural or artificial regeneration silvicultural systems. State tree improvement plans shall consider both methods.

3231.31 - Natural Regeneration

Seed trees shall be phenotypically superior. Where it is not possible to leave high quality trees to reseed an area, encourage artificial regeneration with genetically appropriate planting stock or seed. Do not use Federal Cooperative Forestry funds for technical assistance or silvicultural operations involving dysgenic forest practices.

3231.32 - Artificial Regeneration

The program recognizes five tree improvement program intensity levels. These are:

1. Level 1 - Source-Identified Plant Materials. In level 1, seed used or collected and plants purchased are from known, geographically identifiable locations or seed zones. This identification is used to assure that plants or seed distributed to landowners are genetically compatible with intended seeding or planting sites. An important aspect of a level 1 program is to avoid growth loss or tree mortality from nonadapted planting stock.
2. Level 2 - Seed Collection Stands. This consists in locating several trees or stands within a seed collection zone that are better than average in performance and in designating them for repeated harvests of reproductive material. Generally, these trees or stands are reserved from timber harvest.
3. Level 3 - Seed Production Areas. Such areas are developed in natural stands that have demonstrated better- than-average performance in growth, quality, or seed production. Poorer phenotypes and species that may hybridize are rogued, and the stand usually is protected from insects and disease. Cultural techniques may be applied to increase seed production and harvestability of seed crops. The areas generally are reserved from timber harvesting until no longer needed or suitable for seed production.
4. Level 4 - Seed Orchards. Seed orchards are plantations of seedlings and/or clones from selected trees, managed for the production of reproductive material. Selected trees may or may not have been evaluated for their genetic worth through progeny testing.
5. Level 5 - Selective Breeding. Selective breeding involves the production of seed of known parentage to provide an improved base from which to select materials for advanced-generation seed orchards. Parents included in initial breeding programs usually are selected because of their excellent appearance. As programs advance, selections are based on either the performance of a tree or its relatives or on its ability to help produce progeny of proven genetic superiority.

A State tree improvement plan can provide for simultaneous operation at several of these levels. Seed orchards and selective breeding are expensive. Use them only for valuable tree species where benefit-cost ratios are favorable. A State tree improvement program shall be at level 1 or better to qualify for participation in the Cooperative Forestry tree improvement program.