Fertilizers for Timber Trees

exploratory greenhouse investigations show varying responses of timber trees to soils and to applications of fertilizers

Edward C. Stone

Preliminary studies on the efficacy of fertilizer applications to forest soils indicate that redwood, Douglas fir, and ponderosa pine respond differently to the fertility level of the soil—as judged by response of agricultural crops—and to the application of fertilizers.

A number of similar studies have been made in Europe, Japan, Australia, New Zealand, the Pacific Northwest and eastern United States but it is difficult to evaluate the results of those studies in relation to the conditions peculiar to California.

In the California investigations, Douglas fir on a sandy loam in the greenhouse showed a good response when nitrogen, phosphorus and potassium were applied in an amount equivalent to 300 pounds per acre of each element.

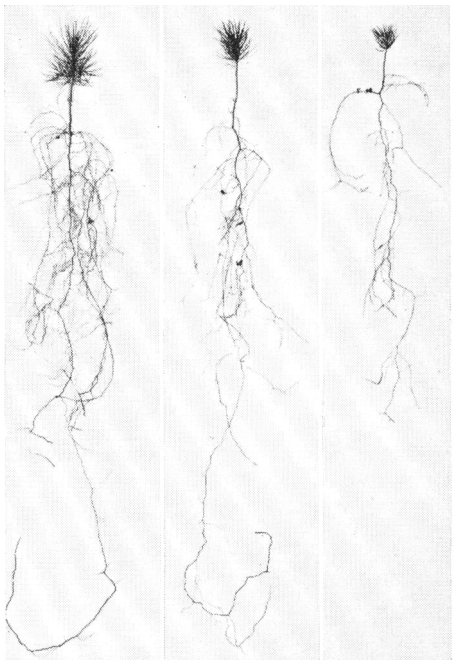
Redwood seedlings on the same sandy loam also showed a good response when the same rates of nitrogen, phosphorus and potassium were added.

A pronounced response to the fertility level was apparent when redwood seedlings on a Soquel soil—a high fertility level soil—showed good growth while seedlings on an Aiken soil—a low fertility soil—made poor growth.

Ponderosa pine seedlings on Soquel and Aiken soils—in contrast to redwood seedlings—did not show a differential growth response.

However, ponderosa pine seedlings did show a differential growth response when grown on an Aiken soil and a Dubakella soil. The best growth was on the Aiken, the next best was on the red topsoil of the Dubakella, and the poorest growth was on the yellow subsoil of the Dubakella. The principal difference appears to be in the relative availability of the calcium and magnesium in the three soils. Ponderosa pine takes up approximately the same amount of phosphorus from all three soils but not the same amount of calcium and magnesium.

Relative growth of ponderosa pine seedlings on an Aiken soil *left*, a red Dubakella topsoil *middle*, and a yellow Dubakella subsoil *right*.



Ash Analysis of Needle Tissue from Ponderosa Pine Grown in the Greenhouse

Soil	% Phosphate	Milliequivalents /100 grams tissue	
		Calcium	Magnesium
Aiken clay loam ..	0.76	41.4	11.4
Dubakella			
Red topsoil	0.79	9.9	31.6
Yellow subsoil .	0.64	4.2	43.1

The problem of timber tree fertilization is further complicated by the presence of distinct edaphic races—varieties that are only found on particular types of soil—of ponderosa pine. For example, seedlings from such a race found on a Dubakella soil near Coloma grew better in the greenhouse on a yellow Dubakella subsoil than seedlings of another race normally found on an Aiken soil also near Coloma.

The need for intensive management of California forests is growing more acute. Two fifths of the land area of the state —42 million acres—is classified as forest land of which approximately one half is commercial forest land. One third—five million acres—of the commercial forest land is understocked and will require intensive management if its full growth potential of one billion board feet annually is to be realized.

Depletion of the state's remaining forests of virgin timber—combined with the continuing expansion of the wood

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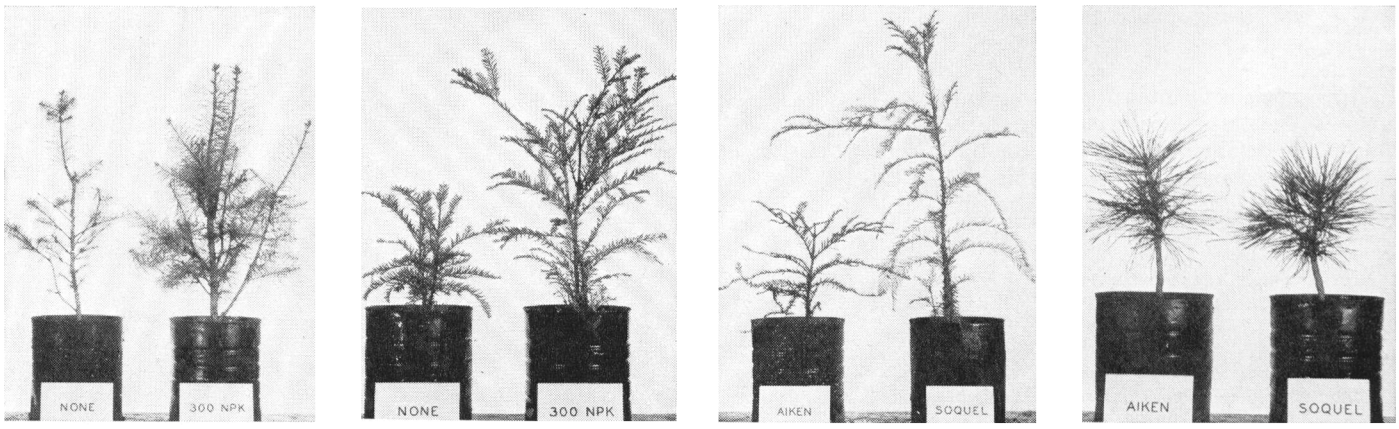
Relative growth of seedlings. *Left* to *right*—Douglas fir (1) and redwood (2) when nitrogen, phosphorus and potassium were added in an amount equivalent to 300 pounds each per acre on an infertile Oakley sandy loam; redwood (3) and ponderosa pine (4) on Soquel clay loam and an Aiken clay loam.



meats were smaller than those with three or more employees in each of the counties—61% to 82%.

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MALEIC HYDRAZIDE

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lateral buds grew sooner and more rapidly than those close to the tip. In some cases the apical bud was inhibited for several weeks after the lateral buds started growth.

Stem terminals of certain plants may abscise with even moderate concentrations of MH but such abscission is not serious. The young terminal leaves of some plants have poor color and may be unsightly if they remain on the plant for the period of the inhibition. Young terminals of *Pyracantha* and other plants that do not abscise may not develop good green color until after the MH effect has been dissipated.

Nondamaging concentrations of MH did not appear to suppress the development of blossoms of those plants investigated but some distortion of leaves and blossoms has been reported on chrysanthemum.

Several resprays have not shown adverse effects on lemons, ivy and Star Jasmine.

The Chinese Juniper—*Juniperus chinensis* variety *mas* or variety *foemina*—normally produces a small amount of needle-like juvenile type foliage on some parts of the plant, but after being sprayed with 0.20% MH as MH-30 it produced the juvenile type foliage on all parts of the plant. That effect lasted for more than a year before the mature, scale-like foliage that is closely appressed to the stem was again produced. The MH treatment completely changed the appearance of the foliage and also suppressed length growth, which resulted in a more compact plant than those not treated.

The young leaves and shoots of camellia—*Camellia reticulata*, Capt. Rawes—did not show immediate and extremely diminished growth after treatment with 0.35%–0.375% MH as MH-40 but only slight or no inhibition, even though the concentration was almost damaging. Later it was apparent that the tip leaves on some shoots had not expanded to normal size or developed a normal green color. The buds on these shoots showed inhibition nine months later, but buds on older portions of the plant resumed growth so that a more branched and dense plant resulted.

Limited trials have indicated that 0.25% MH-30 is compatible with insecticides: DDT 50% wettable powder at two pounds per 100 gallons; diazinon 25E at three pints per 100 gallons; and malathion 25% wettable powder at 2–3 pounds per 100 gallons. Very high concentrations of malathion seemed to nullify the effect of MH-30. MH-40 was not tried in combination with insecticides.

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EARTHMOVING

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arms provide reach for starting to dig, and to carry the removed soil, or spoil. With the pull-type bulldozer the ditch is excavated, cleaned, or trimmed with the machine moving backwards so the tractor does not tread on the wet portion of the ditch. Also, by graded dumping from the blade, the pull-blade machine can spread the spoil as it backs away from the ditch. Because the bulldozer is used for so many various jobs and production depends on the type of work being done figures can not be stated easily.

Graders

Graders or motor patrols are land smoothing tools not normally used for earthmoving but for earth spreading. Their flexibility permits them to be used for earthmoving by plowing ditch excavations into windrows and then spreading the spoil. Primarily distance type machines, graders have a poor turning radius—compared to other earthmovers —and are not economical as substitutes. Also, their production capacity is low for earthmoving, especially when used for short length production because their size limits adaptability.

Scrapers

Scrapers are semiself-loading and unloading earthmovers. Designed for surface removal of soil—rather than for pit or ditch work—production is controlled by scraper bowl size and length of travel in the work cycle of loading, hauling, unloading, and returning to reload.

Total production of scrapers can be increased by lowering the time consumed in any part of the cycle. The haul and return distances have as much effect because they are fixed for a given job and the machine has a limited top speed. Thus rapid loading and unloading and short hauls will maximize their production. Pusher tractors are normally used during loading to increase scraper production in general construction. Limited space in a drainage channel might prohibit the use of pushers for rapid loading.

The per foot cost for drainage ditch construction can be estimated from a comparison of the production rates of the various machines and their suitability to the working conditions.

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TIMBER

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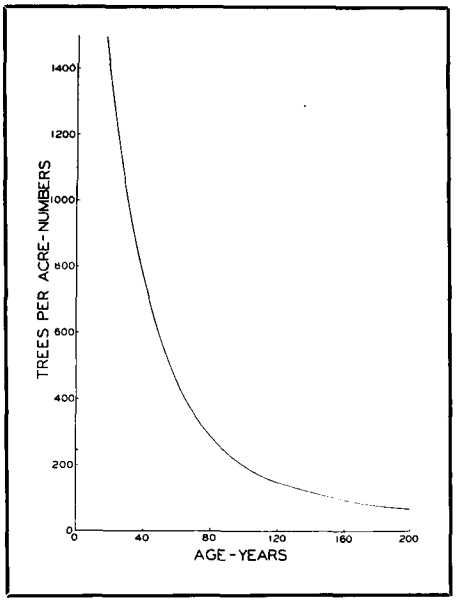
fiber market—will result in a general practice of harvesting younger trees, which will aggravate the forest management problem. The required number of trees per acre at the time of harvest will be greater than it is now in the virgin forest and the number of years necessary for regeneration will become a significant part of the time a tree needs to grow to harvestable age.

Ponderosa pine trees required per acre at time of harvest to fully utilize a good site in the Sierra.



Planned research on the role of fertilizers in the production of timber trees should determine how the soil fertility level affects the potential yield, the initial survival of the seedling, and what relative advantage the seedling may—or may not—gain from fertilizer applications over the associated brush species found on good and poor sites.

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