THESIS

on

A MANAGEMENT PLAN FOR

THE PEARL ARBORETUM AND SCHOOL FOREST

Submitted to the

OREGON STATE AGRICULTURAL COLLEGE

In partial fulfillment of
the requirements for the
Degree of

MASTER OF SCIENCE

by

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The Peavy Arboretum and School Forest were established in 1926. The land is owned by the State of Oregon, and is designed to be a practical laboratory for the School of Forestry of the Oregon State Agricultural College located at Corvallis. It is also being used for the purpose of forestral research and demonstration for the region. Although the tract at present in possession of the School of Forestry is not sufficient in area, it is being enlarged as funds will permit, and it is hoped that in the not too distant future, enough land may be acquired for an efficient management unit.

Oregon should practice forestry. With ten million acres of privately owned forest, that is being cut at the rate of 130,000 acres per year, the state is trying to profit by the experience of eastern forest states. In order that the state may remain prosperous it is necessary that these cut over lands be kept on the tax rolls and made to grow other crops of timber. Forestry in Oregon has been given a great impetus by the passing of the Oregon Reforestation Law which encourages private owners to hold their cut over lands for future crops, thereby stabilizing tax incomes and tending to insure the future of the lumber industries of the state. However, it is not enough that these areas grow timber, they must grow the most timber of the best grade, and give the highest financial return.

Providing a practical laboratory for the gathering of
forest facts, and for the development of men in the various branches of forestry are therefore, the real purposes of the School Forest.

PHYSIOGRAPHIC FEATURES

LOCATION

The School Forest lies in the Willamette Valley, Benton County, Oregon. It is six miles north of Corvallis, in T 10 S, R 5 W, Willamette meridian. A small strip extends to the West Side Pacific Highway, and a good gravel road traverses this strip to the Oregon State Forest Nursery which is located on the Arboretum tract. The maps accompanying this paper show definite locations and topographic features.

ACREAGE

The present area of the Forest is 602 acres. The Peavy Arboretum adds an additional 87 acres, and the Oregon Forest Nursery covers 5 acres making a total of 694 acres.

TOPOGRAPHY

Three creeks originate or flow across the forest. Most of the land is rolling, with a ridge dividing the west half of the forest. There is little rock on the area, and no ledges or heavy outcrops are found. Elevations vary from 450 to 1080 feet.

SOIL

The soil is clay loam, dark and rich in the draws and lighter on the ridges. It varies from 1 1/2 to over 5 feet in depth. There is an average of over two feet of soil.
SITE

The site quality is all No. 11 for Douglas fir. On the level areas and south slopes the quality is poor, on the east slope and ridge tops it is medium, and on the north slopes and northeast it is good.

HISTORY

Settlement began in this part of the Willamette Valley about 1840. At that time the foothills were covered with a few old growth fir, oak, maple, alder, and madrona. Some of these old fir and oak trees were cut for improvement purposes and for fuel wood by the early settlers, but many of them are present in the stand today. Most of the hardwoods on the area are suppressed by the second growth Douglas fir which has seeded in, except along creek bottoms and wet sites where maple and alder still prevail.

There are numbers of large oaks on the Forest that were felled by axe many years ago and the trunks remain today. These trees were cut by stockmen when an unusually heavy snow caught their stock on the hills in the Spring of 1891. The tender twigs and buds of these trees served to keep the stock alive until they could be moved.

A small mill operated in the locality for several years, and 200 acres of the Forest were cut over from 1916 to 1918. Most of this area was clear cut, but in places only the merchantable timber was taken and the poles and advanced reproduction were saved.
When the land for the Peavy Arboretum was bought in 1924 the entire 30 acres had been cut over. On the Cabin Forty the Forest School cut most of the remaining timber into cordwood to put the land in condition for planting. Since that time the only cutting done on the area has been for the removal of a few cords of wood from the Selection plot. This cutting has been in the nature of improvement thinnings, removing the suppressed and deformed trees.

The first planting was done in 1926, and some planting has been done each year since. The log cabin was built in 1924, and the Oregon State Forest Nursery established in 1926.

The entire area had been heavily grazed by sheep and goats before the School acquired the land. Since that time no grazing has been allowed. A few head of stock drift on occasionally but are promptly removed.

PURPOSE OF THIS PLAN

(a) The objectives of this plan are to bring together all the available data concerning the Forest which are necessary for its management.

(b) To determine the time, place, and amount of cutting which can be made, and to place the area on a sustained yield basis.

UTILIZATION SITUATION

MARKETS

The utilization situation for the Forest is very favor-
able. There is a permanent sawmill at Corvallis with a daily output of about 40 M ft. There is a small mill at Lewisburg, two miles from the forest, that runs when the price of lumber is high enough to warrant operation. At present there are two sawmills on Soap Creek, just west of the Forest, but they will be cut out in a few years and probably will be moved.

In Albany, seven miles to the east, there are two furniture factories and a sawmill using alder, maple, and other hardwoods. Other hardwood markets are in Portland.

There is a fair sale for cordwood in both Corvallis, and Albany, and a possibility exists of making arrangements with the Oregon State College to take a large part of the wood cut for a number of years.

Pulp mills are located in Salem, thirty miles distant, and at Lebanon, about twenty miles away. These offer a ready market for any white fir that may be grown on the Forest.

LABOR SUPPLY

With the local farmers who are willing to work through the winter, and with Corvallis and Albany in driving distance, there will be little difficulty in securing the necessary labor. It is possible that some scheme can be worked out whereby the students of the Forest School could work Saturdays. This would give them practical experience, and help defray their college expenses.
There is a paved road from the Forest to Corvallis, and good gravel roads to Albany. There is a Southern Pacific station in less than a mile of the Forest where logs can be loaded.

SILVICULTURAL POLICY

OBJECTIVES

With the use of the Forest for research purposes it is to be expected that the objectives will be varied. They may be altered with the changing utilization situation, and it may become desirable to change species.

The present objectives should be:

(a) To so cut the present stand as to leave the land in the best possible condition for regeneration.

(b) To cut those areas first that are not giving a fair increment, and to make thinnings when practicable.

(c) To make studies along silvicultural lines covering methods of handling the different species, their growth and regeneration.

SYSTEMS

Most of the area will be worked on the clearcutting system, and planting will be done each year to replace cut.

An area has been set aside for Selection cutting, and another for the Shelterwood system. Those latter plots have been left along a road for ease of access. The observations made thus far seem to indicate that with densities over 50
percent of normal, new reproduction not only fails to come in, but the advanced reproduction dies.

STUDIES

The following studies are under way on the Forest. They are being carried on by different instructors, or by students under the supervision of their professors.

(a) Effect of thinning on the rate of growth of the remaining Douglas fir.

(b) Rate of decay of down Douglas fir timber.

(c) Rate of decay in standing dead timber.

(d) Relation of root competition and shade to survival of Douglas fir seedlings.

(e) Spacing experiment with Douglas fir.

(f) Durability of Oregon woods in contact with the soil, and the effectiveness of various methods of preservation. This is the widely known "Post Farm" experiment.

(g) Rate of growth in Douglas fir following "Economic Selective" logging.

(h) Eradication of poison oak.

(i) Growth rate and adaptability of species planted in the Arboretum.

(j) Race study of Western Yellow Pine.

(k) Survival of maple seedlings under mature stand.

(l) Effects of grazing on survival of seedlings.

(m) Slash disposal and decay.

(n) Cascara survival on different sites.
When cuttings are made all hardwoods should be removed with the other timber. Stumps should be cut low to favor coppicing. The general aim is to favor the growth of hardwoods on the regeneration areas as long as they do not threaten the main crop. These deciduous sprouts will aid in building up the fertility of the soil.

European experience has shown that successive crops of conifers, especially on short rotations, have a tendency to deplete soil fertility. We should profit by their experience as it is much easier to maintain soil fertility than to rebuild it after decreased yields have shown this to be necessary.

ALDER-MAPLE

On a considerable area in Forties No. 3, 4, 5, and 6 in Section 36, there is a forest growth consisting largely of maple and alder. It is long, clear timber, up to two feet in diameter, and will work into logs rapidly.

There is a fairly steady market for this timber at furniture factories in Albany and Portland. Alder logs at present are worth $12, and maple $13 per H board foot delivered in Albany.

These hardwoods form a dense shade during the growing season and very little reproduction is coming in under them. The stand is mature and will soon begin to deteriorate.

This has been one of the best seed years for conifers
in a number of years. The area lies on the north slope of a well timbered ridge on which the fir timber is 60 to 80 years of age. If these hardwoods are cut soon and the slash properly disposed of there should be an abundant natural reproduction on the entire area.

By using a low stump height there should be vigorous sprouting, and with a cleaning in a few years, leaving one or two sprouts per stump, a fast growing but scattered coppice forest may be secured. Before this is of a height and density to shade the ground the young conifers should be well established and the shade from the scattering hardwoods will aid in natural pruning of the young fir.

In fifteen or twenty years when the young conifers are large enough fully to utilize the site another crop of hardwoods can be harvested. Thus the alder and maple have served as cover to the site, have assisted in early natural pruning, have been building up the soil fertility, and at the same time have produced a valuable timber crop. This operation will also afford a good experiment in silviculture.

Should natural reproduction fail, the area can be planted to Douglas fir in the fall and the same results secured.

SLASH DISPOSAL

Silviculturists seem to be agreed that broadcast burning is at best only a necessary evil. It should be avoided, and with the close utilization possible in cordwood produc-
tion there should be very little slash left.

If each year's slash is divided by fire lines it should be cheaper and better to allow it to remain and decay. Under this system the slash helps to prevent erosion, builds up the soil, and forms a partial shade that should be beneficial to reproduction.

On some areas, especially along roads and trails, it will be best to pile and burn. In some instances spot burning may be advisable where large amounts of debris have accumulated in a few places.

This is an excellent field for research, and all methods can be tried on adjoining plots to study the difference in reproduction and growth. An interesting study in run-off and erosion under each method of slash disposal could be carried on at the same time and should give worth while information.

PROTECTION

The Forest lies in an area of low fire hazard. Lightning fires are practically unheard of in this region, but logging operations and slash to the west and north increase the danger. Hikers on the area, and the ungrazed bald spots and cut-over land tend to increase the hazard greatly.

Fire lines have been constructed on the west side of Sec. 36, and a wood road on the south serves the same purpose. There is also a fire line along the main ridge. These fire lines consist of a space 25 to 30 feet wide,
raked to mineral soil.

A lookout tower is also being constructed, but it is not expected to be manned except in case of exceptional hazard. At present the only protection afforded the area is by the nurseryman who can be depended upon to start action in case of fire.

When the Forest reaches 2000 to 2500 acres in size it will be imperative that some man be on the area during the season of high fire hazard. Most of his time may be spent on improvement work of various kinds, but at least twice a day he should climb the tower and give the Forest a thorough survey. At present a 5 man fire equipment cache should be maintained at the nursery. It should be in a box where it would be easily accessible in the absence of the nurseryman.

Some fire proofing might well be done along the roads and trails, especially on the arboretum area. This would consist of clearing the brush and debris from the trail for 10 or 15 feet on each side. Proper signs should be placed along the roads and trails warning hikers to be careful with fire, and as strict a policy of law enforcement as possible should be carried out.

The insect problem in Douglas fir is very small. In case of heavy infestations it may become necessary to take action for protection, but this is not to be expected except as an emergency measure.

Douglas fir during its early life is relatively free
from fungi attack. Unless some serious disease is imported there will be no problem along this line.

The greatest enemy to the Forest is likely to be man. Signs, newspaper articles, and all other known devices of education should be used to prevent him from setting fires, cutting and picking shrubs and flowers, and from hacking and otherwise defacing the trees and improvements.

MANAGEMENT POLICY

OBJECTIVES

The following are the objectives to be attained in the operation of the School Forest:

(a) To work the Forest on the basis of a sustained yield, always keeping in mind the goal of a normal forest.

(b) To provide suitable conditions for research in reforestation and allied forestry fields.

(c) To protect the site from deterioration or erosion, and to conserve and protect the water on the area.

(d) To handle the area in such a manner as to maintain its greatest aesthetic value.

(e) To make of the Forest the most effective place for laboratory and field work for the students of Forestry.

CLASS OF PRODUCT

The Forest should be managed for saw logs and cordwood. The timber that will bring the greatest returns in saw logs should be sold as such, the small trees, tops, and small logs should be worked into cordwood.
Near the end of the present rotation considerable white fir may be harvested from the Forest for pulpwood.

**ROTATION**

A rotation of 60 years is recommended. This rotation will produce timber large enough for the saw. McArdle's studies in second growth Douglas fir show this age to be the culmination of mean annual increment in cubic feet per acre, and also approximately the age at which mean and periodic annual increment are equal on Site II.

**ALLOWABLE CUT**

Due to the great variability in the density of the stand, the cut should be made on a pure volume basis. This will allow for the supply of a constant market, and a great improvement in the character of the stand in a few years.

With the present stand and area it will be possible to cut 500 cords of wood, or its equivalent, per year. A converting factor of 500 feet, board measure, to the cord is assumed. Of course this does not mean that 250 feet of logs can be produced annually, as tops, and timber too small for logs will be cut into cordwood. At the present price for second growth stumpage, logs are hardly worth more than cordwood.

**PROGRESS OF CUT**

In some stands it will be necessary to cut as much as ten acres to secure the volume allowed in the annual cut.

* The Yield of Douglas Fir in the Pacific Northwest
Peavy Arboretum and School Forest Type Map

- Peavy Arboretum
- N - Oregon Forest Nursery
- Planting
- Clear cut
- Selective cut
- Forested
- Compartment No.

4" = 1 mile
These areas should be cut first to allow regeneration and normal growth to begin. In the more densely stocked stands it will require only about four acres to get the same volume. By leaving the better stocked stands until the last, the maximum growth will be secured on the entire forest.

The Selection area in lot 15, Sec. 36, has an annual increment of 28 cords. Since allowance will be made for lag in reproduction, and for increase in density, only 25 cords per year will be cut. This leaves 475 cords or equivalent to be cut elsewhere.

During the first good seed year in this region a reproduction cutting should be made in the Shelterwood lot. It may be desirable to make preparation cuttings earlier to get the ground in shape. It would seem best to handle the plot in two units, cutting one the first seed year, and the other the next. By this system a seed cutting can be made any year without greatly increasing the annual cut. Although this arrangement is made only because it is impossible to forecast seed years, and of course any cutting on this lot only postpones the cutting on some other area for the same length of time.

Clear cutting should begin in lot 13, Sec. 36, and lot 16, Sec. 35. These lots will furnish the cut for the first three years. Felling is started here because of the poor stocking and the composition of the stand, and because it is the most accessible of the areas to be clear cut. Opera-
tions will then move up through forty No. 12, Sec. 36, and then into forty No. 5 of the same section.

Part of the annual cut will be supplied from time to time by the timber cut on the north end of the Peavy Arboretum as it is removed to allow for planting, but this volume will be small and is simply allowed as a factor of safety.

When forty No. 3 was logged several years ago the small trees were left. Reproduction has started under this stand and it would be advisable to remove the overwood to give the young growth a chance. There are 600 cords of wood on this forty, but practically none of it is large enough for saw logs.

Hardwoods have been omitted from the computations of volume, but are included elsewhere.

OTHER INFORMATION

GRAZING

No grazing can ever be allowed on the Arboretum. Grazing should not be allowed on the present forest because of damage to reproduction, plantations, and experiments. At some future date when more land has been acquired it may be permissible to graze the areas with advanced reproduction and mature stands.

RECREATION

This property is owned by the people of the State of Oregon and should be open to recreational use by the public as long as due care is exercised, and necessary regulations
observed. Hunting should not be allowed because of the danger to human life. On the contrary, the area should be converted into a State game preserve to encourage the breeding of birds and wild animals for the pleasure of the public. There are no streams large enough for fishing. Camp sites and camping would increase the danger of fire, and cost of administration. They would also interfere with the intended use of the Forest, so should not be allowed.

Hikers should be encouraged. Through them the basic education of forestry and a love of the outdoors can be brought to thousands of people. "Show me" trips could be arranged, and through demonstrations of proper methods might have a far reaching influence on the forest policies of the state.

WATER PROTECTION

The only water originating on the Forest which is used for potable purposes, is from the springs that furnish water to the Oregon Forest Nursery, and the cabin. Their protection should not be difficult. Great care should be taken to keep the other streams from becoming polluted, as they are now used as drinking water by students working on the area.

ACQUISITION POLICY

As money becomes available a policy of land acquisition should be carried on in the region surrounding the present Forest. There are some 2000 acres of forest land along the
ridge between the present Forest and the Soap Creek road that lies in tracts such that it could be purchased by individual ownerships. By buying other legal subdivisions or lots from farmers whose land extends into the area it would be possible to acquire another thousand acres.

This would give the Forest an outlet to roads almost on all sides. It would make it possible to manage and cut it to the best advantage, and would make it more accessible for inspection and student use. It is all one natural management unit.

Most of the area in question is either cut over or in immature Douglas fir. Some of it has been selectively logged and has the material at hand for another cutting in about 20 years, but most of the cut over land has been clear cut and burned without even seed trees having been left.

The general policy of acquisition should be to buy the cut over land, and that bearing immature forest growth. The land that is now in mature timber should be purchased after it has been cut. This policy is recommended because of the decreased cost, even though it will take another rotation to get the area under regulation. If sufficient funds are ever available more mature timber would greatly improve the Forest for student use.

Those tracts which join the present Forest should be bought first. An effort should be made at all times to keep the Forest as well blocked up as possible, for ease of man-
agement and supervision. This would prevent any land owner from demanding an excessive price in the belief that the School would want to get the land blocked up. Anyone demanding an excessive price for land should be allowed to keep the property. The Forest is a long time project and can wait until reasonable terms can be made. No one tract of land is indispensable.

The recommended order of purchase by ownerships is as follows: Stella Smith, Valley Mills, Carnage, Burge, Lawrence, and Harwood. The accompanying map shows limits of forest land proposed for ultimate purchase.

IMPROVEMENTS

The road to the top of the ridge that is being started up Starker Creek should be pushed as rapidly as possible. Then a road should be run down the ridge to the south boundary of the Forest. This road can be very easily built, and will serve the double purpose of road and fire line along the top of the ridge.

By the expenditure of a few hundred dollars a dam could be built across Starker Creek just east of the north quarter corner of Section 36, and a lake of two or three acres formed. This lake would be on the main creek, near the road being built, and could be made a thing of great beauty, and might be of use in the future as a storage pond for logs.

The forty corners have never been set on the Forest. As these corners will be used in tying in experiment plots,
cutting areas, and improvements, they should be set. This work can be done by the Engineering classes, and the corners might also be established as bench marks.

PERSONNEL

As soon as possible there should be a full time man in charge of the Heavy Arboretum and School Forest. It will be a job that will require considerable hard work and study to manage properly. This man should be in charge of all cutting on the Forest, and all planting on the Forest and Arboretum.

Student planting on the Forest may prove satisfactory, but student planting should not be used on the Arboretum. It prevents the best arrangement of species, and may cause poor survival. All arboretum planting should be done by the man in charge with the assistance of one or two helpers when necessary.

This man should also keep an up-to-date map of the entire area. Any class experiments or other work should be reported and located by him before operation is started. This will prevent long time experiments being placed where they might hinder the regular progress of felling or improvements. One man must be in direct charge of, and responsible for, the Forest if the best results are to be obtained. Of course he must be under the supervision of the Dean of the School of Forestry.
The object of a forest arboretum is the growing of as many tree species, both native and exotic, as the conditions of soil and climate will permit. The intent or purpose is not primarily the growing of timber, but the production of a collection of trees of as great a variety of species as possible. It is an extensive experiment in the adaptation of tree species to this locality. Good management demands the removal and use of the trees when they become decadent, but with most species this varies from one to five hundred years. The larger a tree becomes the greater its value for this particular type of forestry.

It is therefore understood that monetary profit is to be foregone for the educational and aesthetic value of the Forest and that considerable time and expense may be necessary for its development.

The Peavy Arboretum consists of 67 acres that will be devoted to such purposes. Of this amount 27 acres have already been planted, and another 10 acres are in native hardwoods that will be left and encouraged. In the plantations there has been a high mortality due to summer drought, rodent work, and lack of care, and all plots are in need of refilling.

Probably no other section in the United States is more suitable for arboretum purposes than the Willamette Valley. The climate is cool enough for practically all the northern species and the winters are mild enough for any species that
is at all frost hardy.

The arboretum area varies from wet swampy sites to dry hill slopes, but the soil does not have the same range, being limited to a rich clay loam. No sandy sites are available.

With an assured permanency through its connection with the State College, the Peavy Arboretum should, in the future become one of the show places of the Pacific Coast. The greatest need is for sufficient funds with which to carry on the work, all of which has been performed thus far by the faculty and students of the Forest School.

It seems probable from past experience that hardwoods will have to be favored by cultivation or spading for the first few years in order to relieve them of the intense competition from grass and briars during the dry, summer months. Some of the less hardy conifers may require the same treatment, but most of them are able to compete successfully. The fact that such treatment can not be given forest plantings is of no importance, as this is not intended as a practical forest.

In the past, due to lack of other land, some experimental field plantings have been made on the Arboretum area. In the future no such planting should be made, as it interferes with the best use of the land for arboretum purposes. Such practical experiments should be made on land intended for timber growing.
Every effort should be made to get as many species established as possible in the next few years. The general aim will be to get variety, even though only a few trees of each species can be secured at a time. As nearly as possible all plantings of one genera should be in the same locality. The site requirements of the different species to be planted will determine their placement within this area.

The large, native trees on the Arboretum area will be preserved, especially the hardwoods. There are a number of large oaks that are in need of a thorough pruning in order to assure their recovery from suppression. Some of the other hardwoods which have already been cut can be quickly grown to ornamental size by cecre and thinning of coppice sprouts. This is especially true of the madrona grove along the road, north of the nursery.

Whenever possible, seed of the species to be planted will be secured and the young trees grown in the Forest Nursery. This will make it possible to plant late in the fall and winter, the best time for planting in this locality, when eastern nurseries are frozen up and not delivering any stock. At the same time it will be an aid in getting the plants accustomed to the new climate, and will also reduce transportation costs.

The hardwood grove along the creek should be cleaned and trimmed. The trees having broken tops should be removed unless they are putting out new growth and are needed to
complete the crown cover. Any open places should be planted to tolerant species.

The fir on the north end of the Arboretum should be cut as the land is needed for planting. In cutting, every effort should be made to save any hardwoods on the area, especially the rarer species. Failure to save some of the native species has retarded the development of the Arboretum and may make planting necessary.

Thus far all the arboretum planting has been on the entrance tract and the Cabin Forty. The Entrance has been planted with both hardwoods and conifers. This seems a very good plan and the fail places in the plantations should be filled with different species of the same genera.

Conifers have predominated in the planting on the Cabin Forty. With the exception of the two small hardwood plantations already on the area this forty should be reserved for conifers.

Due to its moist sites and favorable exposure, Forty No. 1 is well suited for hardwoods, with the possible exception of a strip adjoining the coniferous area, and it should be planted to broad leaf species. There are at present about 5 acres in excellent condition for planting, and the remainder can easily be prepared as needed. The swampy sites should be saved for moisture loving species, such as Liriodendron, Magnolia, Fraxinus, Liquidambar, Populus, and Nyssa.
DISCUSSION OF CRUISE AND VOLUMES

Some years ago a student cruise of the area was made and the volumes were computed by the International log rule. As the Scribner-rule volume and percent of normal stocking were desired, the area was re-cruised. A two inch diameter class was used and all trees 12 inches and over were tallied on sample strips. In addition, type maps were made and site qualities determined.

The basal area of these trees was computed, and the percent of normal stocking was figured using the values determined by McArdo* for basal areas of normal stands of that age and diameter limit as an index. Then from his tables the cubic volume per acre was calculated for a stand having that percent of stocking. A converting factor of 95 cubic feet per cord was used in all computations.

A possibility of error is introduced by this method through variations in the number of trees below 12 inches, but as the total volume of these is small the error would be slight.

GROWTH AND YIELD

An extensive study of growth in Douglas fir has recently been completed.* By using these values for a normal increment and applying to them the weighted percent of normal stocking of the School Forest, an average annual increment.

* The Yield of Douglas Fir in the Pacific Northwest
of 109 cubic feet, or 800 board feet, Scribner rule, per acre is being obtained.

In computing the volume that can be cut at the time the stand should be harvested, no allowance has been made for the tendency of an understocked stand to approach normality.

Although studies seem to indicate that a stand tends to approach normality at the rate of 4% per decade, there are insufficient data to warrant the use of this rate. However, if these data are correct there will be an increase of as much as 24% in density toward the latter end of a 60 year rotation. This would make a large increase in the total yield of the School Forest.
SPECIES ON THE PEAVY ARBORETUM

The names of indigenous species are based on the U. S. Forest Service Check List. Exotic conifers are based on Dallmore and Jackson’s “Handbook of Coniferae”. Exotic hardwoods were checked with Bailey’s "Standard Cyclopedia of Horticulture". Some species were not listed in either reference, and those names were taken from the tags on the trees.

CONIFERS

Abies amabilis-------------------Silver fir
  " balsamea-------------------Balsam fir
  " concolor-------------------White fir
  " fraseri-------------------Southern Balsam fir
  " grandis-------------------Lowland White fir
  " lasiocarpa-------------------Alpine fir
  " nobilis-------------------Noble fir

Cedrus atlantica-------------------Atlas cedar
  " deodara-------------------Deodar cedar
  " libani-------------------Cedar of Lebanon

Chamaecyparis lawsoniana---------Port Orford cedar
  " nootkatensis---------Alaska cedar

Cupressus arizonica------------------Arizona cypress
  " macnabiana------------------Macnab cypress

Chinko biloba------------------Maiden Hair Tree

Juniperus cedrus------------------Canary Island juniper
Larix dahurica------------------------Dahurian larch
"   europaea------------------------European larch
"   kaempferi-----------------------Golden larch
"   kurilensis----------------------Kurile larch
"   leptolepis-----------------------Japanese larch
"   occidentalis---------------------Western larch

Libocedrus decurrens-------------------Incense cedar

Picea engelmannii----------------------Engelmann spruce
"   sitchensis------------------------Sitka spruce

Pinus caribaea------------------------Slash pine
"   contorta--------------------------Lodgepole pine
"   coulteri--------------------------Coulter pine
"   densiflora------------------------Japanese red pine
"   echinata--------------------------Shortleaf pine
"   echinata rigida---------------------
"   excelca--------------------------Bhotan pine
"   greggii---------------------------Gregg's pine
"   halepensis------------------------Aloppo pine
"   jeffreyi--------------------------Jeffrey pine
"   lambertiana-----------------------Sugar pine
"   laricio--------------------------Austrian pine
"   leiophylla-------------------------Chihuahua pine
"   longifolia------------------------Long-leaved Indian pine
"   montana mugho---------------------Mugh's pine
"   monticola-------------------------Western White pine
"   montezuma------------------------Mexican pine
"   muricata-------------------------Bishop pine
Pinus nigra calabrica---------------------
  " patula-------------------------------Spreading-Leaved pine
  " palustris-----------------------------Longleaf pine
  " pumila---------------------------------Macedonian pine
  " pinaster-------------------------------Maritime pine
  " ponderosa-------------------------------Western Yellow pine
  " radiata-------------------------------Monterey pine
  " resinosa-------------------------------Norway pine
  " strobus-------------------------------Northern White pine
  " sitchensis-----------------------------Hybrid
  " sylvestris-----------------------------Scotch pine
  " taeda-------------------------------Loblolly pine
  " thunbergii----------------------------Black pine

Pseudotsuga macrocarpa-------------------Bigcone spruce
  " taxifolia-----------------------------Douglas fir

Sequoia sempervirens----------------------Redwood
  " washingtoniana------------------------Bigtree

Taxodium distichum------------------------Southern cypress

Taxus brevifolia--------------------------Pacific yew

Thuja orientalis--------------------------Chinese arbor-vitae
  " plicata-------------------------------Western Red cedar

Tsuga mertensiana------------------------Mountain hemlock

HARDWOODS

Acer circinatum--------------------------Vine maple
  " macrophyllum--------------------------Bigleaf maple
  " negundo-----------------------------Boxelder
Acer pseudoplatanus-------------------Sycamore maple
    " saccharinum-------------------Silver maple
Aesculus hippocastanum-----------------Horse chestnut
Ailanthus altissima---------------------Ailanthus
Alnus rubra-----------------------------Red alder
Amelanchier florida---------------------Western Serviceberry
Arbutus menziesii-----------------------Madrona
Bamboo-----------------------------------(Two species)
Betula japonica-------------------------
    " lutea-----------------------------Yellow birch
    " mandshurica----------------------
    " nigra-----------------------------River birch
Castanea dentata------------------------Chestnut
    " sativa---------------------------European chestnut
Catalpa speciosa------------------------Hardy catalpa
Cladrastis lutea------------------------Yellowwood
Cornus nuttallii------------------------Pacific Dogwood
Crataegus douglasii----------------------Western Thornapple
Elaeagnus angustifolia-------------------Russian olive
Fraxinus pennsylvanica lanceolata-------Green ash
    " ornogona------------------------Oregon ash
    " mandshurica----------------------
    " velutina-------------------------Velvet ash
Gleditsia triacanthos-------------------Honey ash
Juglans californica---------------------California walnut
    " nigra---------------------------Black walnut
Liriodendron tulipifera----------------Yellow poplar
Morus alba tatarica-------------------Russian mulberry
" rubra-------------------------------Red mulberry
" kagavanhac-------------------------
" nigra-------------------------------Black mulberry
Malus rivularis--------------------Creeon crab apple
Populus alba------------------------White poplar
" trichocarpa hastata-----------Northern Black Cottonwood
Prunus emarginata-----------------Bitter cherry
"-----------------------------------Patagonian
Quercus garryana-------------------Creeon white oak
" borealis--------------------------Red oak
" mongolica gross serrata---
Rhamnus purshiana-----------------Cascara
" cathartica------------------------
Robinia pseudoacacia---------------Black locust
Salix-----------------------------Two species)
Sambucus coerulea-------------------Blueberry elder
Ulmus americana--------------------American elm
" pumilla--------------------------
" japonica-------------------------
## Stand Tables

*showing volumes, stocking, and time of cutting*

<table>
<thead>
<tr>
<th>Comp No.</th>
<th>Area acres</th>
<th>% Stocked</th>
<th>Scribner Vol. Per A.</th>
<th>Total M</th>
<th>No. Cords Per A.</th>
<th>Total</th>
<th>Age (yr)</th>
<th>Yrs. to Grow</th>
<th>Cords When Cut</th>
<th>Yrs. to Cut</th>
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<td>37</td>
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<td>580</td>
<td>43</td>
<td>1925</td>
<td>60</td>
<td>—</td>
<td>1925</td>
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<td>60</td>
<td>21,343</td>
<td>533</td>
<td>70</td>
<td>1890</td>
<td>60</td>
<td>—</td>
<td>1890</td>
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<td>40</td>
<td>59</td>
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<td>1,010</td>
<td>68</td>
<td>2740</td>
<td>60</td>
<td>10</td>
<td>3260</td>
<td>6.8</td>
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<tr>
<td>4</td>
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<td>73</td>
<td>43,560</td>
<td>1,42</td>
<td>109</td>
<td>4350</td>
<td>80</td>
<td>20</td>
<td>5100</td>
<td>10.7</td>
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<tr>
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<td>900</td>
<td>58</td>
<td>2320</td>
<td>60</td>
<td>30</td>
<td>3260</td>
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<td>52</td>
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<td>3000</td>
<td>60</td>
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<td>62</td>
<td>1560</td>
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<td>55</td>
<td>2520</td>
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</tr>
<tr>
<td>Select.</td>
<td>25</td>
<td>50</td>
<td>21,469</td>
<td>537</td>
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<td>1600</td>
<td>60</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>330</strong></td>
<td></td>
<td><strong>8,291</strong></td>
<td><strong>23,735</strong></td>
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<td><strong>59.2</strong></td>
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</tbody>
</table>

*Note: Comp No. stands for compartment number.*
REFERENCES

CHAPMAH, H.H. 1926- Forest Finance
CHEESE, E.G. 1929- Sylvics
HAWLEY, R.C. 1921- The Practice of Silviculture
HILEY, E.G. 1930- The Economics of Forestry
GRAVES, H.S. 1911- The Principles of Handling Woodlands
JACKSON, H. 1921- A Short Manual of Forest Management
RECKNAGEL, A.B. 1917- The Theory and Practice of Working Plans

" 1926- Forest Management

ROTH, FILBERT 1914- Forest Regulation


MUNGER, T.T. 1911- The Forester

NISBET, 1905- The Forester

TROUP, R.S. 1928- Silvicultural Systems

WOOLSEY, 1927- American Forest Regulation