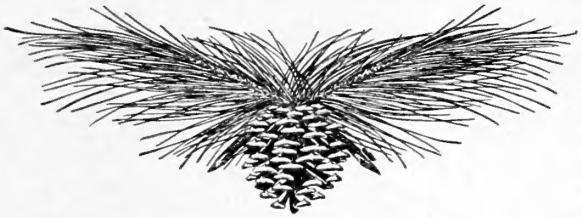
FOREST WORKER



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CONTENTS

Announcements

Seventh International Forest Experiment Station Congress

The seventh congress of the International Union of Forest Experiment Stations is to be held in Stockholm July 22–27, 1929. The preliminary program includes the following subjects: Reorganization of the International Association of Forest Experiment Stations and the adoption of rules whereby it shall be governed; arrangement for an international bibliography of forestry; the standardization of measuring methods and the investigation of experimental plots; methods and terminology in the sphere of forestry soil science. Arrangements are being made for a trip of about one week through south and central Sweden before the opening of the congress, and a week's excursion in north Sweden after the meeting adjourns, to demonstrate forest conditions, silvicultural methods in practice, and the work of the Swedish Institute of Experimental Forestry.

Inquiries in regard to the congress should be addressed to Statens Skogsförsöksanstalt, Experimentalfältet, Sweden.

Examinations for Forest Service Positions

An examination for the grade of junior forester will be held by the Civil Service Commission in the middle of March, 1929, and one for the grade of junior range examiner two weeks later. The entrance salary for both these grades in the Forest Service is $2,000. Nonassembled examinations for various grades of the silviculturist and forest ecologist series are also to be held in the near future, for the purpose of filling vacancies in the forest experiment stations and providing registers as bases for future appointments in forest research positions as these organizations expand. An examination will also be held in the forest economist series. Appropriation increases effective July 1, 1929, will enable the Forest Service to begin the national survey of the timber situation for which $3,000,000 is authorized by the McSweeney-McNary Act, and to begin a study of the cost and return of timber growing. Salaries for different grades in the three series mentioned are: Assistant, $2,600–$3,100; associate, $3,200–$3,600; full grade, $3,800–$4 400; and senior, $4,600–$5,400.

Inquiries in regard to these examinations should be addressed to the Forest Service or the Civil Service Commission in Washington, D. C.

The Western Forestry and Conservation Association will hold its annual meeting March 18–19 in Seattle, Wash. The main topic of the meeting will be The Problem of Full Perpetual Protection for Nonearning Cut-Overs and Reforesting Lands. Current protection, forest growing, and research projects in which the agencies represented in the association are interested will be discussed.

Dr. E. A. Ziegler invites correspondence from foresters, lumbermen, and others interested in technical forestry, in regard to a European forestry tour for which a party plans to sail between April 10 and 15. This is the sixth annual tour managed by Doctor Ziegler with Dr. C. A. Schenck as guide and director. It is planned to study forestry work in Holland, Switzerland, France, and Germany. A side trip will be made into Sweden and Finland if a sufficient number desire it. Expenses will be about $580. The return date is June 9. Doctor Ziegler is to be addressed at the Pennsylvania State Forest School, Mont Alto, Pa.

Because the free edition of this periodical is necessarily limited, it can be distributed without charge outside of the Government service only to such persons and organizations as State forestry and conservation officials, State agricultural extension directors, faculties and libraries of forest schools, and forestry associations. Others desiring to obtain copies of the FOREST WORKER can do so by sending 5 cents for a single copy or 25 cents for a year's subscription to the Superintendent of Documents, Government Printing Office, Washington, D. C. Foreign subscriptions: Yearly, 35 cents; single copies, 7 cents.

Material offered for publication in the FOREST WORKER should be addressed to L. C. Everard, Editor, United States Forest Service, Washington, D. C.

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State Forestry

Community Forests Spread in New York

The community-forest idea has unmistakably carried New York State. At the beginning of 1927, Conservation Commissioner Macdonald reports, there were 217 community forests in the State; at the end of 1928 there were 317. The past year saw forest projects initiated by 24 villages, 12 school districts, 4 counties, 3 towns, and 1 city, first-year plantings under these projects aggregating 596,000 trees.

Ten New York State communities began their forest plantings as long ago as 1909 or 1910. These are the cities of Glens Falls, Gloversville, Johnstown, and Rochester, the county of Chemung, and the villages of Carthage, Ilion, Sherburne, Sidney, and Waterville. The watershed of Carthage is now protected by a forest of 843,000 trees, the largest village forest in the State; the forest of Rochester, on its Hemlock Lake watershed, contains 1,545,000 trees; and the Glens Falls watershed-protection forest, the second largest municipal forest in the State, now has 2,207,000 trees.

New York City has reforested several thousand acres on its Ashokan watershed. Planting on this municipal forest, the largest in the State, was begun by contract but has now made use of 2,541,000 trees raised in the State nurseries.

Forest planting by counties has been strongly urged by the New York Conservation Commission as a means of profitably utilizing abandoned farms and other idle land, of which the State contains several million acres. Within the last few years this plan has rapidly gained favor. At the end of 1920 only 5 counties in the State had established forests, but the number has now swelled to 34. Outstanding examples are Otsego County, which is planting regularly each year and has now planted 1,106,000 trees; Erie County, which has appropriated $55,000 for a 5-year program of purchase and reforestation of idle farm lands; and Scoharie and Oswego Counties, which have planted 150,000 and 136,000 trees, respectively.

The latest movement is for the establishment of forests by school districts. An interesting example is the school forest of the town of Watson, in Lewis County. Each year the Watson school children celebrate Arbor Day by planting 10,000 forest trees on a 94-acre tract of cheap land bought for this purpose in 1921. Projects such as this are encouraged not only for the sake of future revenue for school support but because of the educational benefits both to the school children and to the community.

In the 317 community forests of New York State there have been planted 20,817,500 trees of all the varieties furnished by the State nurseries. Forest trees for planting on publicly owned land are supplied by the State without charge.

Municipal Forests in Ohio

The city of Wellston, Ohio, is developing a municipal forest on lands in Jackson and Vinton Counties surrounding Lake Alma, the source of the city's water supply. The city-owned land surrounding the lake totals about 400 acres. A planting program has been worked out through the cooperation of the State forestry department and a first planting of 10,000 Norway pines and 10,000 Scotch pines was made last spring. On 300 acres of second-growth timber, principally oak, chestnut, hickory, and poplar, woodland improvement work is to be carried on under a plan outlined by the extension forester.

The city waterworks department of Akron, Ohio, has developed a transplant nursery in which more than 200,000 seedling trees are growing to a size that will enable them to compete with heavy sod. In Barberton, Ohio, the city waterworks department began planting on a large scale in 1928 and plans, along with the reforesting of idle land, to develop a wide shelter belt of pine or spruce all around the large city reservoir. Such a shelter belt prevents much débris from being carried into the water, in addition to acting as a soil binder to prevent rapid erosion of the banks. Evergreens are preferred for this purpose not only because they form an effective shelter throughout the year but because the leaves of deciduous trees accumulate around outlets and tend to stain the water.

Other Ohio cities that have established municipal forests are Cincinnati, Oberlin, Cleveland, and Akron.

California Park Bond Issue Approved

The California park bond issue was approved in the November election by a large majority. The proposition voted upon provides for a State bond issue of $6,000,000. This amount is to be expended by the State in the establishment of parks on the basis that half the expense of each project shall be met from other sources. A state-wide survey of California to provide a basis for the choice of areas for park purposes has been made under the direction of Frederick Law Olmsted.

The $25,000,000 forest bond issue proposed in Pennsylvania was defeated in the election, as was the $20,000,000 bond issue for forest, game, and fish preserves and public shooting, fishing, and recreation grounds in Illinois.

Reforestation Work in Los Angeles County

In the fiscal year 1927–28 the forestry department of Los Angeles County, Calif., collected 6,698 pounds of clean tree seed. The 908 pounds of conifer seed was principally of Coulter pine, piñon, and Jeffrey and Digger pine, and included 25 pounds of bigcone spruce. The 5,790 pounds of hardwood seed included black walnut, canyon live oak, California buckeye, California scrub oak, coast live oak, and other species. In addition the department collected 510 pounds of seed of wild cherry, manzanita, and other brush species. During the year the department planted 85,957 trees for reforestation purposes and used 4,271.5 pounds of tree seed in direct seeding. It also distributed 41,332 trees to individuals without charge for planting on major watersheds and sold 13,005 trees.

Although about 4,500 trees were removed from the highways, primarily owing to street alterations, plantings made by the department and by private individuals under department supervision resulted in a net gain during the year of about 8,000 trees along roads other than State highways and along streets in unincorporated sections of the county.

The year's fires burned over 328 acres of timberland and 24,561 acres of brush watershed in the county, as well as more than 7,300 acres of pasture land and hay and grain fields. Several of the disastrous fires of the year occurred in December and February. In Los Angeles County no month in the year can be considered to be outside the fire season, County Forester Turner tells us, and the light rainfall that has been experienced in several successive years has brought about a serious fire situation, with the lower portions of shrubs dying out and the leaf mold highly inflammable.

A new ordinance that came into force April 2, 1928, regulates the building of cabins and other structures on the brush-covered areas of the county and provides for the maintenance of firebreaks around such structures.

Some 60 miles of firebreak was cut and burned during the year, most of the work being done with a tractor, and 42.9 miles was maintained. More than 18 miles of new trail was constructed, and 49.8 miles of permanent telephone line was built. An exceptionally difficult task performed during the year was the erection of a lookout tower and cabin on the summit of Mount Islip, at an elevation of 8,240 feet. All the steel and other material used in this job had to be packed on muleback or by man power over a distance of 9 miles, up a grade of more than 7,000 feet.

During the year the fire-prevention bureau exhibited prize-winning booths at the Norwalk, Downey, Baldwin Park, Puente, and Pomona Fairs and also installed booths in Altadena and Belvedere Gardens. In April the department purchased a motion-picture projection machine and several reels of films. The fire-prevention bureau in cooperation with other divisions has supervised the production of two reels of film showing various phases of the work of the department. Fire-prevention talks illustrated with these films have been made by members of the bureau throughout the public schools of the county, at the county and other fairs, and before a large number of civic organizations.

Tree Planting by New York Sportsmen

Sportsmen of New York State have a new mark to shoot at since the Chenango Fish , Game, and Gun Club in 1928 planted and caused to be planted a total of 1,779,500 forest trees. This record, for which the James S. Whipple reforestation cup has been awarded to the club, more than doubled any that had previously been set up by a sportsmen's club in New York. Second rank for 1928 went to the Cortland County Sportsmen's Association for the planting of 256,000 trees. The Lowville Club took third place with the planting of 228,000 trees, and the Genesee Country Club made the fourth highest score of 137,000.

Conference of Massachusetts Town Forest Committees

A conference of town forest committees of Massachusetts was held in Boston December 7, at the call of Harris A. Reynolds, secretary of the Massachusetts Forestry Association. Under the Massachusetts law a town forest, once established, is managed by a town forest committee of three. Mr. Reynolds's plan was to get these committees together for the purpose of learning what was going on in the various towns, and also for the purpose of forming the committees into a central organization. The meeting had an attendance of nearly 100 people. The speakers included Mr. Reynolds, State Forester Foster of New Hampshire, and R. T. Fisher, director of the Harvard Forest. Resolutions were adopted calling for a meeting in 1929, at which plans for a permanent organization will be taken up.

Town forests are owned by 80 towns in Massachusetts.

Fire Losses Reduced by Minnesota Association

The Wales Forest Protective Association, organized in 1922 by timber owners of the Wales district, Minnesota, is reported by the Smoke Screen to patrol not only 120,000 acres of land belonging to its members but 63,240 acres owned by the State and 516,760 acres in miscellaneous ownership. The association owns 90 miles of telephone line and has six lookout towers including three steel towers built in cooperation with the Minnesota State Forest Service. Its headquarters include a cook camp, warehouses, ice house, machine shop, bunkhouse, oil station, office, and houses for ranger and assistant ranger. It has tools and equipment for 200 fire fighters, including 2 gas-motor pumps, and employs from 12 to 20 men. During the past seven years $127,854 has been spent by the association, and $10,960 by the State, to protect the 700,000-acre district from fire. The year before the association was formed, a single fire on this district caused a timber loss of more than $50,000; in the 7-year period since its formation, the total damage by forest fire in the district is estimated to have been $7,224.

Oregon Wardens and Inspectors

Under the cooperative fire-protection plan that covers a great part of the timberlands of Oregon, fire wardens are employed jointly by timberland owners' associations and the State. The choice of men for these positions is made by the directors of the associations with the approval of the State forester. Along with the major administrative work of forest protection, the wardens are responsible for issuing a large proportion of the burning permits that are required by the State's fire code. The burden of law enforcement, however, is laid not on the wardens but on inspectors employed wholly by the State. It is the duty of these inspectors to visit all mills, logging operations, and other centers of fire hazard, notify the operators of any points in which they are delinquent, and follow each case of violation until it is settled.

The Chamber of Commerce of Stokes County, N. C., has appropriated $750 for cooperation with the State forestry division and has entered into a contract for the organization of a warden service. This is the first forest fire protection contract entered into with the North Carolina Department of Conservation and Industry by a commercial organization.

The North Carolina Board of Conservation and Development has made $25,000 available for the establishment of a new game farm in the eastern part of the State.

Black Walnut Planting Advocated for Indiana

Black walnut timber sold at an average price of $108 per 1,000 board feet in the standing tree in Indiana in 1927, Acting State Forester Wilcox tells farmers of the State in advising them to plant this species. "One type of land that is especially adapted to the planting of black walnut," says Mr. Wilcox, "is the lowlands adjoining streams that are occasionally overflowed. The overflowing of the land for short periods does not injure the black walnut. Some of the best soils of the State are on the flood plains adjoining the streams. On flood plains where the soil is extremely rich and is well drained but at the same time has plenty of miosture, the black walnut makes rapid growth and should produce fair-sized saw logs in 35 years' time." The walnut will grow well, he adds, not only on the lowlands but on moist slopes or almost any land of fair fertility. It should not be planted on sour clay soils that have become eroded or have been "farmed out." It is well to set out the walnut trees in mixture with pine, spruce, or sugar maple so that they are spaced approximately 8 feet apart. The spruce can be marketed at a good profit in from 10 to 15 years for Christmas trees.

Alabama Fire Cooperation Takes in New Territory

The cooperative forest-protection system of Alabama now covers more than 14,825,000 acres, the State commission of forestry announces. Three new districts established last fall added 1,090,320 acres to the total protected area. One of these includes the extreme southern portion of Chilton County and all of Autauga County except a strip along the southern and eastern boundaries; one comprises the whole of Dallas County; and the third includes about 138,000 acres in the south central part of Wilcox County and the north central part of Monroe County. Districts previously established have recently been enlarged by the addition of about 355,170 acres of land in Calhoun, Clay, Cleburne, Randolph, and Tuscaloosa Counties.

The men appointed as forestry agents of the three new districts are, respectively, W. O. Durbin, Vida, Ala.; Frank Averyt, Orrville, Ala.; and O. J. Black, Natchez, Ala.

A new steel lookout tower and watchman's cabin have been erected by the New Hampshire Forestry Department on the summit of Rock Rimmon in the town of Kingston. This is intended to cover a group of towns in south central Rockingham County. Another steel tower and cabin were recently completed on Oak Hill in the town of Loudon, near the Concord line. This tower is approximately in the center of a 40-mile stretch between other stations.

Georgia Landowners Build Fire Breaks

Georgia landowners last fall demonstrated unusual interest in firebreak construction, Assistant State Forester Merrill reports, especially in the country north of the Altamaha River. This special effort to prevent fire is being made with the idea of saving the large crop of seedlings expected from last year's heavy seed crop of both longleaf and slash pine. The usual procedure in building the firebreaks is to plow a furrow or two about 20 feet inside the road and parallel with it, then burn the strip between road and furrow.

A new forest nursery site of about 95 acres has been acquired by the New York Conservation Department in the village of Horseheads, Chemung County. The department plans to get the soil in shape so that seed beds and transplant beds may be used this spring.

Six units of land totaling 600,000 acres have been placed under organized fire control by the Florida Forest Service since April, 1928. The owners of more than 400,000 acres of land in addition to this have applied for cooperation from the State in fire protection. State Forester Baker will undertake protection on additional areas as soon as well-rounded units can be shaped up.

About 43 miles of forest-fire safety strip was built in the spring of 1928 by railroads in the Forbes forest district of Pennsylvania, which comprises Allegheny, Fayette, Greene, Somerset, Washington, and Westmoreland Counties. (Allegheny County includes the city of Pittsburgh.) This is 17 per cent of the total mileage of railroad safety strip needed in the district, Assistant District Forester Kurtz reports. The cost averaged $68 a mile.

Education and Extension

Yale's Tropical-Wood Collection

Yale University's tropical-wood collection now contains 14,000 specimens, representing nearly 1,400 different genera of 160 natural families. The wood samples, pressed and dried leaves, flowers, and fruits, and accompanying notes on the size and abundance of the trees and the local uses of the timber have been contributed in the main by volunteer cooperators living in the Tropics. Professor Record, who has charge of the university's department of tropical forestry, says:

All sorts of people in out-of-the-way places are delighted at this opportunity for contact with the outside world and willingly devote their leisure time to such work with no thought of reward other than recognition and appreciation. There is an unwritten rule that the first new species discovered by any collector is named in his honor. During the past three years about 125 new species have been discovered by Yale's unofficial staff. This volunteer corps is but the nucleus of a regiment it is hoped to enlist. Some of the largest commercial organizations operating in the Tropics encourage their employees to undertake such work.

On every field trip Professor Record and his field assistant, G. Proctor Cooper, endeavor to find and train local collectors and observers. Since the tropical work must be correlated with that of the temperate regions, the tropical forestry department has collectors and correspondents in almost every forest region of the world.

Through cooperation with the United Fruit Co. the forests of Guatemala, Honduras, and Panama are being carefully explored at very small cost to the university. A civil engineer has for the past year been sending in the first detailed accounts ever obtained of the forests of eastern Nicaragua. The foresters of Porto Rico, Haiti, and British Guiana are cooperating with Yale. Specimens from Cuba are contributed by a number of correspondents and collectors of whom the most active are a nurseryman and a priest.

The newest cooperative project is a study of the West African forests on the concession of the Firestone Plantations Co., in Liberia.

School Forest Presented to Oregon State

Twenty-four hundred acres of cut-over forest land in Columbia County, Oreg., has been given to the Oregon State Agricultural College and is to be used by its school of forestry for research in reforestation. The land is situated just south of Kerry and west of Clatskanie. The donor is John W. Blodgett, timber owner of Michigan and Oregon.

A new addition to the forestry equipment of this college is a research dry kiln, standard size as to cross section and taking stuff up to 22 feet in length. The kiln is fully equipped with automatic recording devices. It will be used not only in research but in demonstrating dry-kiln methods to mill men.

The college entered on the present school year with a record enrollment of 186 forestry students.

A record-breaking registration is reported this year by the New York State College of Forestry, with 147 students admitted as freshmen and 11 students in advanced standing accepted by transfer from other institutions. The college quota was filled by August 27, and admission was refused to 35 applicants.

Farmer Makes a Profit from Thinning His Woodland

By R. W. GRAEBER, Extension Forester of North Carolina

Last winter G. M. Hatley, a farmer of the Hudson community in Caldwell County, N. C., decided to find out for himself whether the operation of thinning a body of farm timber would pay its own expenses, in addition to bringing about a better spacing of the trees left standing.

Mr. Hatley says: "During the winter months I have a lot of idle time that I would like to put to use at a reasonable wage. I decided that if by thinning my timber I could make $2 a day for my own labor and part of the time an additional $1 a day for my team, it would be better than being idle or going rabbit hunting."

With the help of County Agent P. M. Hendricks, Mr. Hatley selected for his demonstration area an acre of second-growth shortleaf pine about 28 years old. The pines had reclaimed an abandoned field previously allowed to erode badly. They had stopped all gullies and had made fairly good growth.

Mr. Hatley's cutting left on his acre a full stand of 320 of the thriftiest, straightest, and most vigorous trees, so spaced as to make rapid growth. He cut the thinning into poles, at a rate of three or more cords a day, crediting himself with 75 cents a cord for this work. At 50 cents a cord for hauling the wood to an open field he found he could make wages for himself and his team. He was obliged to hire someone else to saw the poles into blocks, at $1 a cord. The cost of splitting was $1 a cord. Hauling to market at $2 a cord gave wages for himself and for his team. This made a total labor cost of $5.25 a cord, and the wood sold at $7.50 a cord. The sale of 8 cords gave a net return of $18 an acre for the stumpage, enough to pay taxes and interest on an acre of cheap land for several years, and a net labor return to Mr. Hatley of $34.

These returns have persuaded Mr. Hatley in the future to cut all his wood supply on this basis and to market wood as a means of obtaining income from farm labor during the winter months.

The acre of pine timber thinned last year will require another thinning in from five to eight years; thus a periodical harvest from the land is provided for.

Mr. Hatley set a good example in marketing his wood as a finished product. The day is rapidly passing when farmers can sell wood in 4 to 8 foot lengths. The market demands a finished product ready for the stove.

A maple products display was shown at county fairs at Oakland and Hagerstown, Md., last fall, illustrating old and new methods of handling the maple-sugar crop. Interest was attracted by means of a realistic representation of a flow of sap from tree trunks exhibited, which was arranged by concealing tanks of sweetened water inside the trunks.

Forestry News for High Schools

High-school papers of Washington and Oregon have a special correspondent in the Portland, Oreg., office of the United States Forest Service. For the fifth year John D. Guthrie, assistant district forester at Portland, is supplying the high schools of the two States with press material on forestry specially prepared for their use. Every other week throughout the school year Mr. Guthrie sends the schools a brief release. Together with incidents in the life and work of forest rangers and forest-fire stories, he introduces fundamental facts about forest problems. Many of the schools use the material in English, economics, or civics classes and also on bulletin boards. The school editors are invited to make suggestions as to the choice and presentation of material.

Ohio Four–H Forestry Clubs

In the second year since the beginning of Four–H forestry club work in Ohio, boy and girl members of the clubs have planted 103,500 forest-tree seedlings on their home farms. The seedlings, which were principally pine, came from the State forest nursery. Four–H forestry clubs are now organized in seven counties of the State and have a membership of 126. Each first-year member is required to plant forest trees on 1 acre of his home farm. Other work of the clubs includes studies in tree identification and in farm woodland management.

Mississippi Holds Essay Contest

Mississippi school children in the grades from sixth to twelfth, inclusive, are invited by the State forestry commission to compete in writing essays on Why Mississippi Should Practice Forestry. Essays must not exceed 1,000 words. The contest opened on Arbor Day, December 14, 1928, and will close on April 1, 1929. In each of three divisions of the State there will be awarded three prizes of $25, $15, and $10, respectively.

Mississippi Maps Show Forest Land Areas

Five maps prepared and distributed by the Mississippi Forest Service show acreage and location of remaining timberlands of the State; forest land—that is, land classified in the 1926 report of the State tax commission as timbered or "uncultivable"—by counties; the proportion of forest land that is in farm woodlands, by counties; estimates of the value to be derived annually from timberland if it is protected from fire and managed on a sustained yield basis; and the proportion of farm area that is in woodlands, by counties.

Changes in the Michigan Curriculum

Changes put into effect at the beginning of the present academic year by the school of forestry and conservation of the University of Michigan in courses leading to the bachelor's and master's degrees, Dean Dana writes, establish a minimum requirement of one semester's work in each of the 12 subjects dendrology, silvics, silviculture, mensuration, fire prevention and control, forest entomology, forest zoology, forest pathology, logging and milling, structure and properties of wood, forest regulation, and either forest economics or forest policy. Fifteen hours of the student's schedule in the 2-year course leading to the degree of bachelor of science in forestry are left open for continuation courses in any of these subjects or for advanced work in the basic sciences or in subjects classified as cultural. The third year of the course leading to the degree of master of science in forestry, which is regarded by the school as its standard course, is elective throughout, the choice of subjects being restricted only by the requirement of approval by the dean of the school.

During 1929 the university hopes to replace the present surveying camp for foresters with a summer forestry camp in the Upper Peninsula of Michigan, at which field instruction will be given in forest mensuration, fire prevention and control, and forest improvements. When this summer schedule goes into effect, the requirements in these subjects at Ann Arbor will be reduced, leaving greater opportunity for election of courses in forestry and allied subjects.

Forest Service Notes

Lake States National Forest District Created

A new national forest district has been created, embracing the States of Minnesota, Wisconsin, and Michigan. These States were formerly included in the Rocky Mountain National Forest District, which has its headquarters at Denver, Colo.

The new district, to be known as the Lake States District, contains four national forests having a total area of nearly 1,200,000 acres of Government land. In recognition of the acute need for reforesting large areas in this region that are adapted for timber production but are now idle, the National Forest Reservation Commission has approved a program contemplating the acquisition for national forest purposes of 2,500,000 additional acres of land in the three States. This proposed extension of Government ownership of forest lands, and the possibilities for development of forest resources represented by the vast acreage of privately owned forest lands in the Lake States, have made it desirable that the region be covered by a separate administrative organization of the Forest Service.

Earl W. Tinker has been made district forester of the new district. As assistant district forester of the Rocky Mountain National Forest District Mr. Tinker has for several years supervised the land exchange and acquisition work of the Forest Service in the Lake States. He is a native of Michigan and a graduate of the Michigan State College of Forestry. Following a year of graduate work in the Yale Forest School he was employed in forestry work by the Canadian Pacific Railway. He has been a member of the United States Forest Service since 1915, serving within that period as supervisor of the Arapaho and Bighorn National Forests and as assistant chief of forest management in the Denver office.

District headquarters are being established temporarily at Madison, Wis.

Caustic Soda Treatment Improves Glued Joints

Certain species of wood that frequently produce weak or inferior joints when glued into doors, furniture, airplane propellers, and similar articles have been found by the Forest Products Laboratory to produce stronger joints if treated with caustic soda. The woods experimented with were sugar maple, yellow birch, white oak, red oak, red gum, black cherry, basswood, and osage orange. A 10 per cent solution of caustic soda gave the best results, although the strength of joints was improved by the use of weaker solutions. The wood surfaces to be joined were brushed with the solution, after 10 minutes were wiped with a cloth, and were then allowed to dry before being glued. After 10 days' conditioning the glued blocks were given machine tests for strength.

The effect of the caustic-soda treatment in improving the strength of glued joints was especially pronounced in certain woods in which "starved joints" are ordinarily produced. ("Starved joints" are those in which the film of glue between the wood surfaces is not continuous.) This is well illustrated by the results obtained in tests of sugar maple glued with animal glue. The shearing strength of a piece of untreated wood glued under favorable conditions was 3,110 pounds, as compared with 1,570 pounds for an untreated piece with starved joints, and 3,250 pounds for a piece treated with caustic-soda solution but glued under the same starved-joint conditions.

To Burn or Not to Burn for Lodgepole Regeneration

In a typical lodgepole-pine stand on the Medicine Bow National Forest, at the southern boundary of Wyoming, a study of natural reproduction after cutting showed that much larger numbers of seedlings came in on areas where the slash had been piled and burned. The investigators, Silviculturist Carlos G. Bates and Forest Supervisor Huber C. Hilton, have not been moved by these results to advocate the general practice of slash burning on such areas. Instead they advocate the method of slash disposal that was followed by less abundant reproduction, on the basis that in this case enough is greatly preferable to more than enough. The reproduction established where the slash had not been burned was fully sufficient to develop stands of the complete density that characterizes lodgepole pine and that gives rise to the slender, lightly limbed stems for which the species is noted. The additional numbers of seedlings produced where slash was piled and burned, instead of serving any useful purpose are a detriment to the development of the stand. Superabundance of the seedlings retards their growth while they are yet small, sometimes bringing the youthful stand into a state of stagnation. On the usual Medicine Bow site and on many others the problem with lodgepole pine is not how to obtain adequate reproduction but how to restrict reproduction so that the young stands can develop to commercial sizes at a satisfactory rate without artificial thinning.

The area on which this study was made is a flat of better than average site quality, where both soil and climatic conditions conduce to heavy reproduction. On plots that were clear cut a count of seedlings 10 years after cutting showed 13,231 seedlings per acre where the slash had been piled and burned and 4,120 per acre where the slash had been scattered and left to decay on the ground. On plots where groups of trees constituting from 30 to 35 per cent of the volume of the stand had been cut, leaving openings from 20 to 30 feet in diameter, the seedlings numbered 62,509 per acre where the slash had been piled and burned and 21,956 per acre elsewhere. On plots where the volume of timber had been reduced in the same proportion by a selective cutting that thinned the stand as evenly as possible, the comparative numbers of seedlings were 72,558 and 25,424.

The early influence of slash left on the ground in retarding lodgepole pine reproduction is attributed partly to the fact that this method of slash disposal leaves the humus layer in a comparatively undisturbed condition and results in its being increased. This tends to keep seed from reaching the more even moisture of mineral soil. The second factor by which this influence is explained is the effect of shade in preventing germination; previous experimentation showed that lodgepole seed germinate promptly and fully only when subjected to considerable daily fluctuations of temperature. Evidence that the leaving of slash results in more vigorous growth of reproduction after the first few years and that it conduces to gradual seeding, which involves less danger of overstocking and stagnation than does the appearance of vast numbers of seedlings at the same time, was brought out by tallies made on the clear-cut plots 10 and 15 years, respectively, after cutting. On the plot where the slash had been scattered and left many of the seedlings were taller and were growing faster than the best of those on the plot where the slash had been piled and burned; and between the dates of these two tallies the number of seedlings increased on the former plot, while decreasing on the latter.

On clear-cut areas an undesirably numerous crop of seedlings may come in even if slash is left on the ground, if the tree tops left are especially heavy with cones. In this event it is recommended that the tree tops most heavily laden with cones be selected out of the slash and burned. Since individual trees vary greatly in their retention of cones, the selection of such tops is a simple matter. The conclusions from the Medicine Bow study would limit the use of fire in lodgepole stands to the burning of such tree tops and the burning of coarse, unmerchantable material, branches, etc., in spots or lanes where this material would otherwise constitute a special fire risk.

In this study spots of ground where the humus had been destroyed by fire were observed three years after the burning to have relatively few seedlings growing in their centers, but many around their edges where cones, as well as coarser material of the slash piles, had escaped burning. Later some seedlings started in the centers of these spots and developed rapidly.

On clear-cut plots very even distribution of seedlings was obtained, the earlier seedlings advanced rapidly in size, and 10 years after the cutting moderate numbers of new seedlings were observed to be coming in.

On uncut plots adjoining those on which the experimental cuttings were made more than 26,000 seedlings per acre were found. Those making appreciable growth were sufficiently numerous to guarantee the future of the forest if all escaped damage during the eventual cutting of the mature timber, but their distribution was very irregular.

A study similar to that on the Medicine Bow Forest was carried out by Mr. Bates and Forest Supervisor Theodore Krueger on the Gunnison National Forest, a little southwest of the center of Colorado. The area studied was a steep northwestern slope, and was less productive than that studied on the Medicine Bow. Reproduction was studied on uncut plots, clear-cut plots, and plots on which heavy and fairly heavy cuttings were made. Practically no reproduction was found on uncut areas except along edges adjacent to open areas. On both thinned and clear-cut plots an examination 12 years after cutting disclosed adequate reproduction, the average number of seedlings per acre

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for the four plots ranging from 2,225 to 6,049. On one clear-cut plot an overabundance of reproduction was found on an area where the soil had been considerably disturbed by the moving over it of timber cut on adjoining higher ground. On the Gunnison area there appeared no such crops of underdeveloped and probably short-lived seedlings as composed a part of the very heavy reproduction on the more fertile Medicine Bow area.

The observation that typically dense stands of lodgepole pine reproduction have usually come in after fires that almost or completely destroyed the parent trees has in earlier years led foresters to question whether burning might not be necessary to obtain adequate reproduction of this species after cutting. The lodgepole pine has a faculty of retaining its seed year after year in tightly closed cones clinging to the branches. Earlier studies by Mr. Bates indicated that such cones may comprise the equivalent of three normal yearly seed crops. The opening of these cones by the heat of the fire, and the clearing away by the fire of vegetation that would have competed with the pine seedlings, largely explain the profuse reproduction following fires. The studies here reported indicate that, quite independently of fire, lodgepole pine reproduction is easily obtained on medium-to-good sites wherever sufficient cutting is done to make room for it. A very light thinning induces the partial establishment of great numbers of seedlings, of which sufficient numbers are likely to be on hand for many years after such a thinning so that, following a second cut, a new stand would quickly develop. Under partly cut stands reproduction may develop well in spots but is likely to be as patchy as is the stand that is left. This unevenness is further accentuated by the burning of slash in piles, which tends to remove all root competition from the immediate area, including that of the trees left. It is believed by the investigators that adequate reproduction can be obtained on clear-cut areas of any extent unless the cones in the tops of trees cut are largely destroyed by burning.

Tree to Tree Spread of Western Yellow Pine Blister Rust

The western yellow pine blister rust (*Peridermium Harknessii*) can spread directly from tree to tree, according to the results of an experiment in the Halsey plantation on the Nebraska National Forest. When a search by pathologists had failed to disclose alternate hosts for the rust in this plantation, where the disease broke out several years ago, a shelter of muslin 4 feet square was placed around some 1-year seedlings of western yellow pine and some of the fruiting bodies of the rust were scattered over these seedlings. The seedlings were transplanted at the end of their second year and were held in the transplant beds for one year. Last spring four of the 3-year-old transplants were found to have well-defined peridermium galls apparently about ready to fruit.

Ips and the Sun Cure

Sun curing of western yellow pine trees felled on the Prescott National Forest, Ariz., in 1928 did not prove effective in ridding the trees of broods of the engraver beetle (*Ips*), although similar treatment has been used with success as a method of controlling the western pine beetle (*Dendroctonus brevicomis*) and the mountain pine beetle (*Dendroctonus monticolae*) in parts of California and on the Crater National Forest, Oreg.

The experiment was conducted by Ranger John C. McNelty. Blackjacks 60 to 80 years old and 14 to 16 inches in diameter at breast height were felled in the vicinity of Groom Creek, the fellings beginning the latter part of March and ending the first part of June. Because Ips are especially attracted to the bark of freshly felled trees, it was possible to experiment with trees that when felled had not yet been attacked by the insects, and thus to watch the attack from the very beginning.

The logs were so placed that with few exceptions they were exposed to sunlight from about 9 a. m. to between 3 and 5 p. m.

The attack on the first tree felled was slow and covered a period of three weeks. In other cases the tree was attacked within one week on the half next the ground and within two weeks on the half more exposed to the sun. One log that had a diameter range of from 8 to 16 inches and that was exposed to sunlight from noon until 2 p. m. was attacked completely in three days, and all of the brood matured. The logs that were exposed to the sun for longer daily periods were attacked on the upper half only after the shaded part had been filled, sometimes as late as two weeks after the first attack. Some of the logs less than 6 inches in diameter were never attacked on the upper portion.

The size of broods varied with the size of the log and the thickness of the bark. On a log not more than 6 inches in diameter and having bark about one-fourth inch thick, the insects were killed in the larva stage over a space about 4 inches wide on the upper side. On logs less than 10 inches in diameter having bark about one-fourth inch thick, 50 per cent of the insects were killed over a space 3 to 4 inches wide on the upper side. On logs 10 inches or more in diameter having bark more than one-fourth inch thick, no death loss occurred in the brood.

The temperature of the logs, taken at irregular intervals, was found not to vary greatly during warm weather. The highest temperature recorded for an individual log was 118° F., and the highest average temperature recorded for the logs in any day was about 112° F. When the highest log temperature was registered the ground alongside of the log had a temperature of 140° F. On warm days the ground temperature was usually from 108° to 114° F. The daily maxima for air temperature were from 80° to 90° F.

According to the results of this experiment the maximum kill from sun curing that could have been obtained by turning the logs is 50 per cent on material

less than 8 inches in diameter and 20 to 30 per cent on logs between 8 and 10 inches in diameter.

Logs up to 24 inches in diameter from which one-fourth of the bark surface was removed, in four strips, and which were exposed to sunlight did not produce more than one-third of the brood of Ips ordinarily found on untreated logs of that size.

Although this experiment indicates that solar heat will not destroy broods of Ips unless it reaches higher temperatures than those ordinarily recorded in the vicinity where the test was made, it was observed that Ips did not attack the upper portions of logs so readily when these were exposed to the sun and that they made a heavy attack on logs so exposed only when other material was not available. Where Ips are prevalent, Ranger McNelty concludes, it would seem that limbs and logs from 4 to 8 inches in diameter may well be placed where the sunlight will strike them and that trees more than 8 or 10 inches in diameter may well be scalped on four sides if they are to stay on the ground. When the majority of the Ips are in either the larval or the pupal stage it is worth while to peel the attacked log, leaving the bark in the sun with the inner side up. This treatment will kill the larvæ and pupæ, but will not affect the mature insects.

Sample Plot Check on Timber Sale Marking

By Quincy Randles, United States Forest Service

National forest officers in charge of project timber sales in the Southwestern National Forest District are required to establish at least one 10-acre sample marking plot each 60 days. The timber on the plot is marked and calipered and the volume of timber marked and left is computed by species. This method of sampling the marking has been found of considerable value in checking the percentage of timber removed against the percentage guaranteed by the sale agreement, in determining how closely the standard marking rules as to number and size of seed trees, etc., have been complied with, and in training men to mark timber correctly. Under this method it is possible for the marker to check up on the amount and kinds of timber left per acre.

A special 3-sheet form has been prepared for recording the work done on these plots. The first two sheets provide for a record, by diameter and height, of the trees marked and left; the third provides for a summary, by species, of the number of trees and volume marked and left per acre, also for notes on defect, insects, mistletoe, reproduction, and other factors that influence the marking. A study of the summary sheet for a marking plot enables the reviewing officer to get a good picture of conditions on the plot and the character of the marking.

Application of Second-Growth Douglas-Fir Yield Tables

Having completed the preparation of yield tables for normal fully stocked stands of second-growth Douglas fir, the Pacific Northwest Forest Experiment Station is now endeavoring to work out a method of applying these tables to average stands, which are ordinarily somewhat understocked. On the basis of two field seasons' work on the problem Walter H. Meyer of the station staff has concluded that, by and large, second-growth stands of Douglas fir over large areas have approximately 80 per cent of the volumes given in the tables for normal fully stocked stands. This estimate assumes the exclusion of nonforested areas, or major openings, that are large enough to be type mapped in the survey. According to Mr. Meyer's observation sampling by strips, if the strip width is properly controlled, is more reliable than sampling by plots. The most reliable index of stocking is basal area; total number of trees is a very unsatisfactory index. The largest stand volumes are found on slopes of approximately 40 per cent. South and west aspects are apt to be variable in site quality; north and east aspects are, in general, the most favorable for growth.

Small holes in the canopy represent 10 per cent of the total area of the average second-growth Douglas fir forest according to the estimate of Mr. Meyer, who found that the most important cause of these holes is the presence of gullies, creeks, and small patches of hardwoods. Fire, he found, although it had gone through half the areas studied and had undoubtedly been a factor in thinning the stands when they were young, was not prominent as a cause of small holes in the canopy of forests of pole size and larger.

A digest of the principal yield tables for second-growth Douglas fir was published in the West Coast Lumberman of May 1, 1928.

Knotty Boards for Boxes

A box with short, thick sides is more resistant to rough handling if it is made of knotty lumber than if it is made of clear lumber, the Forest Products Laboratory has found. This finding applies to all boxes made of boards the thickness of which is more than one-sixtieth of their length, and to knotty boards in which no length equal to the width of a board includes knots having diameters aggregating more than one-third of the board's width. In boxes with short, thick sides, unless the shocks caused by rough handling are absorbed by the springing of the boards, failures are apt to occur as a result of a direct pull exerted by the contents of the boxes on the nails. Knotty boards absorb such shocks better than clear boards because they are more flexible.

A Fall Fruiting Elm

By E. H. FROTHINGHAM, United States Forest Service

The elms that bloom in the spring have nothing to do with the case. Ulmus serotina, for which the standard common name is red elm, in the southern Appalachians goes by the name of "September elm" because that is the month when it begins blooming. This little-known species is a tree of considerable beauty and should be popular for street planting. Its range is imperfectly known. George B. Sudworth in the 1927 edition of his Check List of the Forest Trees of the United States stated that the tree was known at different stations "only from southern Kentucky and Tennessee to northeastern Georgia, northern Alabama, northwestern and southwestern Arkansas and eastern Oklahoma, southern Illinois (Richland County)." Bailey says that it has proved hardy at the Arnold Arboretum.

Toward the end of December, 1927, R. F. Maddox, State forester of Tennessee, called my attention to "September elms" growing on his lawn at Nashville. At that late date seeds were still hanging on the trees. I took some of these to Asheville, N. C., where seedlings grown from them during the past summer attained a height of from 12 to 20 inches. Recently Mr. Maddox has supplied the Appalachian Forest Experiment Station with seed from the 1928 crop, which, he says, was an excellent one. Last fall his trees began blooming about September 10, and some were still in bloom on November 5, although at that date ripe seed had been falling from others for several days.

Mr. Maddox says of this tree that it "splits almost like chestnut. Furthermore it is one of the hardiest elms that grow; it can be found on shallow limestone soil right alongside the hackberry." In its free-splitting characteristic it resembles rock elm. As on the rock elm and winged elm, the branchlets are often fringed with thick corky wings.

A Douglas Fir Refuses to Die

A Douglas fir tree on the Olympic National Forest, Wash., that was wind thrown last winter and within a few days was bucked because it lay across a trail, four months later was bearing green, live needles and well-developed cones in which the seed were nearly mature. After it was sawed the tree had no root connection whatever with the ground. It was exposed to full sunlight. The tree's unusual growth was discovered by R. D. Maclay, technical assistant on the Olympic, in June. Tight winter buds appeared on the branches that had broken from the tree when it was thrown, showing that the growth of needles and cones on the branches still attached to it had occurred since that time. On July 12, the day before the tree was destroyed by a fire, Mr. Maclay found the needles soft and pliable and the cones growing in good shape.

Effect of Seed-Bed Density on Survival of Transplants

The Bessey forest nursery, at Halsey, Nebr., which produces stock for field planting on the Nebraska National Forest, has announced the results of an experiment undertaken in 1921 to determine at what density seedlings should be grown for this purpose. In each of the years 1921, 1922, and 1923, four lots of seed were sown in seed beds in such a way as to produce, respectively, stands of 75, 100, 125, and 150 seedlings per square foot. After two years in the seed bed and one in transplant beds, the trees were planted out in alternate rows. At the end of the second year in the field survival counts were made and final costs of each lot were computed on the basis of the surviving trees. For western yellow pine the results show definitely that it is advisable to give seedlings plenty of room for development in the seed beds. This indication was less well marked for jack pine. The records for the two species were as follows:

WESTERN YELLOW PINE

Year of sowing	Density 75 per square foot		Density 100 per square foot		Density 125 per square foot		Density 150 per square foot	
	Field survival (per cent)	Final cost per 1,000	Field survival (per cent)	Final cost per 1,000	Field survival (per cent)	Final cost per 1,000	Field survival (per cent)	Final cost per 1,000
1921	80.0	$4.04	77.0	$4.36	72.4	$4.37	76.8	$4.15
1922	71.0	4.66	64.0	5.30	46.6	7.28	55.0	6.15
1923	74.4	4.70	60.4	5.55	67.2	4.93	51.0	6.51
Average	75.1	4.47	67.1	5.07	62.1	5.52	60.9	5.60

JACK PINE

1921	54.1	$5.90	59.2	$5.18	55.0	$5.53	59.0	$4.91
1922	54.8	5.81	46.8	6.61	47.4	6.36		
1923	77.5	4.39	59.2	5.82	74.0	4.50	49.7	6.44
Average	62.1	5.37	55.1	5.87	58.8	5.46	54.3	5.67

Cost of Lassen Tree Seed Low

The tree seed collected last fall on the Lassen National Forest, Calif., for nursery sowing there in the coming spring cost the Government less than 81 cents a pound. The whole operation of collecting, hauling, spreading, shaking, and cleaning the 605.5 pounds of seed, described by E. E. Carter in the Forest Worker of November, was carried out at an expense of $489.62, or 80.9 cents per pound of clean seed. This amount covered not only reconnaissance, labor, and hauling, but mess, rent, and depreciation on equipment.

One pound of seed of incense cedar, from cones collected by climbing the growing trees, cost $6.61; the 19.5 pounds of seed of sugar pine, collected from felled timber, cost $1 a pound; 10 pounds of white-fir seed,

from cones collected from felled trees, cost 95 cents a pound.

Western yellow pine seed, of which the whole 202 pounds came from felled timber, cost $1.05 a pound. Three cone pickers followed directly after the timber fallers. At first pruning shears were used to cut off the cones, but the shears gummed so that they were discarded in favor of a method something like that of picking corn. While the left hand grasped the cone near its base the right hand was used to snap the cone back over the left wrist. This freed the cone easily and was much faster than cutting with shears. The same motion that snapped the cone off put it into the pail. On this job, which included filling and tying the sacks and carrying them to the truck, the carrying distance averaging about 600 feet, a day's work averaged about 8 sacks.

The cost of the 373 pounds of Jeffrey-pine seed was held down to 65 cents a pound, partly through the contribution of a day's labor by the wife of a forest officer. With one day's work of three forest officers, the wife of one, and two laborers, 45 sacks of Jeffrey-pine cones were collected from felled timber and hauled 1¼ miles to a truck. In one day 16 sacks of Jeffrey-pine cones were collected from young trees growing in the vicinity of the Coppervale ranger station, two men climbing the trees and throwing the cones to the ground and one man and an 8-year-old boy sacking them.

After the seed had been extracted by sun-drying, in order to remove the wings they were tied in a gunny sack, 20 pounds at a time, and the sack was beaten with a flail. This worked very well. The seed were then run through a fanning mill, which blew out all the chaff and dirt and most of the sticks, needles, and scales.

Supreme Court Decree Permits Reduction of Kaibab Deer Herd

The Supreme Court has affirmed the United States district court decree enjoining the Governor and other State officials of Arizona from interfering with the killing of deer by Government hunters on the Grand Canyon Game Preserve where such killing is needed to protect forest lands included in the Kaibab National Forest. The decree of the lower court was modified to provide that carcasses should be plainly marked in such manner as to show that the deer were killed within the limits of the preserve under authority of the Secretary of Agriculture. This decision clears the way for carrying out the Government's proposal to effect temporary relief of the overstocked condition of the preserve by removing a limited number of deer. The carcasses of the deer killed by Government hunters under this authority are to be used in county, State, and Federal institutions.

Through 22 years' protection the deer herd of the Grand Canyon Game Preserve has increased far beyond the number that the available forage supply will support. The surplus deer can not migrate to other feeding grounds, because they are hemmed in on the south and east by the Grand Canyon and on the west and north by a wide belt of semidesert country. The results have been injury to forage cover and to tree and shrub growth, and starvation of many deer. Hunters living in Arizona can not reach the area except with great difficulty, and hunters are not attracted to it from other States because the nonresident license is expensive and permits the killing of one deer only. The Forest Service, being responsible for the administration of the timber, forage, and wild-life resources of the Kaibab National Forest, in which the game preserve of about 1,000,000 acres is largely included, has planned to have the herd reduced by Government hunters.

New Purchase Areas in the Lake States and Vermont Approved

The National Forest Reservation Commission on December 12 approved 171 purchases, aggregating 111,230 acres of land, at an average price of $2.67 an acre. The commission approved the purchase of some 48,000 acres in the newly created Mackinac purchase unit, in Michigan, and of about 6,000 acres in the Marquette area, also in Michigan.

Six new purchase units were approved—the La Croix, containing more than 183,000 acres in the extreme eastern part of Minnesota; the Oneida, the Flambeau, and the Moquah in Wisconsin, totaling about 428,000 acres; the Keeweenaw in the Upper Peninsula of Michigan, 163,680 acres; and the Green Mountain of 100,000 acres in southern Vermont, on the watershed of the Hudson and Connecticut Rivers. The Ochlocknee and Osceola areas, in the extreme northern part of Florida, were also presented for consideration; but before approving any more purchase areas the commission decided to make a survey of its entire program to determine the financial obligation entailed.

Study of a fire that occurred last spring has convinced J. A. Mitchell, silviculturist of the Lake States Forest Experiment Station, that fires in the hardwood country of the Lake States will bear watching for a week or more after they appear to be safe if relative humidity at 8 a. m. goes as low as 50 per cent. This particular fire, which occurred near Goodman, Wis., lasted eight days after it was first brought under control and was well trenched. It made a run on days when the humidity at 8 a. m. was 50 per cent or less, remaining dormant in the intervals.

Supervisor Sam Stoddard Sprays and Saves

The Targhee National Forest, in Idaho, had some bug-infested lodgepole pine on its hands last spring, and but little money with which to do anything about it. The trees were mostly small, and lodgepole has thin bark. On the near-by Bitterroot and Beaverhead Forests a trial had previously been made of spraying the tree trunks with kerosene and burning them standing, and Supervisor Stoddard adopted this method as a way out of his difficulty. The treatment was given to 2,568 trees having an estimated volume of 276,400 board feet. It worked. The destructive Dendroctonus were destroyed. The cost was $0.56 per tree, compared with $1.84 per tree for the few that were felled and burned and with $1.63 per tree for the felling and burning on the Beaverhead last spring.

Spraying the standing trees with kerosene and burning them proved to be 90 per cent effective. Most of the bugs that escaped from treated trees came from the portions of the trunks above the reach of the spray thrown by the small pumps used and the rest from the thick-barked lower stems where the heat was insufficient to penetrate to the wood and thus cook or damage the larvæ. In any future job of the kind a more powerful pump and a fine-stream nozzle rather than a spray should be used. Further, after the tree trunk has been wet all over with the kerosene and the match struck and thrown at its base the flame should be intensified with a stream of kerosene from the pump, around the base where the bark is thick and at the top where increased heat is needed for the portion of the tree beyond direct reach of the pump.

The work was done during the brief period when the snow had melted around the trunks of the trees but not between them and during times of calm or of light winds. The kerosene was hauled by team to control locations in 50-gallon drums on a "lizard" or sled made from two crooked saplings for runners, with bolted crosspieces. About 1½ gallons of kerosene was used for each tree, but Supervisor Stoddard says that if he had the job to do over he would increase this allowance by about 1 gallon.

The entomologists point out that the almost inevitable scorching of the crowns of near-by trees may attract beetles from a distance, and have asked that a close watch be kept to determine whether this happens on the Targhee.

General Forest News

Forests Needed to Restore Eroded Mississippi Bluff Land

By E. L. Demmon, United States Forest Service

In the Mississippi bluff and silt loam upland region drastic measures are needed to overcome the disastrous effects of the soil losses that have taken place and to make possible the proper management of the land in the future.

Nowhere else in the Mississippi Valley, perhaps, have the effects of gullying been so severe as in portions of northwestern and central Mississippi. In this section of gently rolling upland, at one time held to be the best portion of the State for cotton growing, the soil stratum consists in a yellow or brownish loam originally from 3 to 7 feet thick. Originally this land was covered by an open forest of hardwoods and by an abundant growth of grasses that afforded excellent pasture to deer and cattle; it was a natural park, gay with flowers during the greater part of the year.

When this land was cultivated little or no attention was paid to the direction of the furrows. Usually plowing was done "uphill and down," and during the torrential summer rains the "dead furrow" resulted in the formation of washes that cut into the subsoil. Even when they had been filled with soil by plowing these washes would sometimes reopen during storms, shedding the soil in a muddy flood upon the lower lands. This erosion of the surface soil reduced the productivity of the higher lands and resulted in their neglect or abandonment. The crusted surface shed the rain water into the old furrows, which quickly developed into deep, wide gullies or "red washes" and prevented any further cultivation. After a few years the soil stratum of brown loam was cut through to the loose, or loosely cemented, and easily eroded sand that underlay it almost everywhere. Then the run-off, increasing in volume as the gullies enlarged, undercut the loam stratum and caused it to plunge into gullies in huge masses which, together with quantities of sand, were carried into the valleys below, filling the beds of the streams sometimes to the extent of obliterating their channels. As erosion progressed, large areas of upland were completely denuded of their arable soil and left with a surface of bare, arid sand, wholly useless for cultivation. The valleys fared little better; their native vegetation was destroyed, and they were left to the conquest of hardy weeds.

In some portions of the State whole townships of the best class of upland have in this manner been transformed into sandy wastes that can not be reclaimed by ordinary means. Erosion has wholly changed the industrial conditions of entire counties; in some instances county seats have had to be changed because the old town and site had literally "gone down hill" along with the rich agricultural soil. This destruction of lands was greatly aggravated during and just after

the Civil War, when large areas of land once under cultivation were utterly neglected.

No adequate steps are now being taken in the Mississippi bluff country to reclaim land that has suffered from erosion after being cultivated or otherwise deprived of its protective cover. In the Yazoo highlands occasional small tracts of farm woodland can be found where fire has been kept out for a number of years and leaf litter has accumulated to a depth of 2 or 3 inches. Such protected stands of timber amply demonstrate the effectiveness of a good forest cover in controlling erosion. In order to stop erosion in this region it is absolutely necessary that a new forest cover be established on an extensive scale. Where erosion is in the early stages and seed trees remain from a previous stand, the pine type may reestablish itself naturally if fire is kept out. In the hardwood type and in the more seriously damaged lands in the pine type, many hundreds of square miles can be reclaimed only through forest planting. On the worst areas the technical problems involved are extremely complex, and reclamation research is urgently needed. It is highly probable that such engineering measures as the building of dams and terraces must precede attempts at reforestation, and that tree planting must be accompanied by the use of aggressive grasses, vines, and other herbaceous or woody perennials.

Once the steep-sided gullies and almost vertical bluffs are reduced by terracing or other measures to slopes that can support tree growth, and the soil is fixed by means of a forest cover, this cover must be carefully maintained. Continued fire protection will be imperative, and selection cutting will necessarily replace the clear-cutting at present common throughout the region.

Tree Planting for Shelter in the Northern Great Plains

By Robert Wilson, United States Bureau of Plant Industry

For 15 years the Northern Great Plains Field Station of the Department of Agriculture, at Mandan, N. Dak., has been experimenting in the planting of trees for the protection of farmsteads, orchards, and gardens in the semiarid sections of North and South Dakota, Montana, and Wyoming. Its experience has shown conclusively that in spite of the severe climatic conditions a planting of trees can successfully be started on the average upland farm site of the northern Great Plains. Since 1915 the station has furnished trees, plans, and directions for the planting of 2,700 shelter belts on farms in this territory. Two thousand of these plantings, some of them now 14 years old, are making satisfactory growth.

At present the station cooperates with about 250 farmers each year in establishing new shelter-belt plantings. These plantings are not intended to meet in full the needs of the individual farms for protection plantings, but are designed primarily as demonstrations of what can be done when the methods recommended are carefully followed. Only enough stock is furnished to each farmer to plant one complete unit of a shelter belt adapted to conditions on his farm. Usually this unit occupies from 1 to 2 acres of ground.

A planting intended to protect farm buildings and yard from winter storms is placed north and west of them so as to form a belt of uniform width in the shape of a right angle. If the location of the buildings makes it impossible to plant trees on two sides, the shelter belt may be laid out as a single strip on either the north or the west. A space of from 50 to 100 feet is allowed between buildings and the inside edge of the shelter belt. If enough space is available, the belt is made from 100 to 200 feet wide and is laid out to include a snow trap. The space between trees in a row may vary from 4 to 6 feet, and the space between rows from 8 to 12 feet.

A planting intended to protect a garden or an orchard from strong winds in spring and summer is best placed on the west and south, although shelter on the north and east is also of value. A planting for this purpose need not be so wide as that planned for the winter protection of buildings; often a belt of from one to five rows of trees is sufficient. A strip of ground 20 feet wide should be prepared for one row of trees, with an increase of 10 feet in width for each additional row. Because of the distance to which trees send out their roots in cultivated soil, it is best not to plant fruit trees or garden crops within 20 or 30 feet of the shelter belt.

Land on which trees are to be planted in the northern Great Plains region must first be prepared by tillage, because trees can not establish themselves in this region in competition with grass and weeds. Clean summer fallow during the entire season preceding the planting of trees serves the double purpose of killing grass and weeds and keeping the surface in condition to soak in as much as possible of the season's rainfall. If the land is in sod, it may need to be cultivated two years in preparation for tree planting. Cultivation must be continued for about five years after the trees are planted, or until they are large enough to shade the ground. Mulching has not proved a satisfactory substitute for clean cultivation. Fencing is usually necessary to protect the trees from livestock and rabbits, and it is recommended that a strip of ground along the borders of a planting be plowed as a provision against damage by fire.

The trees distributed by the Mandan station for shelter-belt planting are raised in a nursery at the station. To insure hardiness, seed of native tree species are collected locally and as far as possible seed of introduced species, also, are taken from blocks of trees growing at the station or from other plantings in

the region. For broad-leaved species a well-grown, vigorous seedling 1 or 2 years old and 12 to 14 inches in height, or for conifers a transplant 6 to 12 inches in height, is chosen as the most desirable for shelter-belt planting.

In experimental plantings at the station about 90 forest-tree species are being tested for their suitability for planting on farms in the northern Great Plains region. Some 70 testing blocks containing in most cases 100 trees each were planted in pure stand in the years 1915 to 1922, principally to determine the hardiness of the species. In the years 1915 to 1917, 22 shelter-belt combinations were planted to test the ability of trees to grow in direct competition with trees of the same or of different species in adjacent rows and to test the reactions of trees to different spacings. Trials are being made also of different methods of cultivation and of pruning.

Species that have proved capable of successful planting in most sections of the northern Great Plains region include green ash, American elm, caragana, Russian olive, boxelder, cottonwood, northwest poplar, Chinese elm, blue spruce, western white spruce (Black Hills spruce), jack pine, Scotch pine, western yellow pine, tamarack, European larch, and red cedar. Trees tested by the Mandan station and found not to be adapted for general planting in the region are Norway poplar, Carolina poplar, Russian golden willow, and laurel willow.

Spray for Pine Needle Blight in Nurseries

For the control of pine needle blights in the nursery, such as the brown spot blight of the longleaf and other pines caused by Cryptosporium acicolum and the gray needle blight of pines caused by species of Lophodermium, Dr. George G. Hedgcock, of the office of forest pathology, Bureau of Plant Industry, makes the following recommendation:

Spray every two weeks with a sprayer throwing a misty spray, beginning when the young needles emerge and ceasing when growth ceases. Use standard Bordeaux mixture 4–4–50, with the addition of 2 pounds of either whale-oil soap or a casein soap like "Kayso" to every 50 gallons of spray solution. The soap is necessary to make the spray adhere to the pine needles. Ordinary Bordeaux rolls off pine needles like water off a duck's back. I am quite certain that good results will be obtained by spraying thoroughly every two weeks during the growing period, quitting when the needles have hardened and growth has ceased. It is always well to leave here and there an unsprayed row as a check to determine the effect of the spray.

The Southern Forest Experiment Station has reported that longleaf pine seedling plots at Bogalusa, La., sprayed throughout the past summer with Bordeaux mixture or with lime sulphur showed scarcely a trace of brown-spot infection, although the unsprayed check plots were very thoroughly browned by the disease.

Forest Insects in 1928

By F. C. Craighead, United States Bureau of Entomology

[A report prepared for publication by the insect-pest survey]

The western pine beetle (*Dendroctonus brevicomis* Lec.) epidemics, which in 1927 reached unprecedented proportions in southern Oregon and northeastern California, showed a marked decline in 1928. On a large area in northeastern California centering around the Modoc National Forest this insect destroyed approximately 1 per cent of the stand in 1921. The infestation gradually increased until in 1927 about 3½ per cent of the stand was destroyed. Practically 10 per cent of the volume of timber on the area surveyed—or, roughly, some 500,000,000 board feet—was destroyed. Our surveys in the summer of 1928 showed that the losses for the year would be less than in any other year since 1921.

The mountain pine beetle (*Dendroctonus monticolæ* Hopk.) infestation in lodgepole, which has been progressing southward along the Continental Divide since 1909, has for the past two years been centered on the Bitterroot National Forest, Mont. The control project initiated by the Forest Service in the Bighole Basin in an attempt to keep this epidemic from spreading to the east side of the Continental Divide and into the Madison, Gallatin, and Targhee National Forests will have to be abandoned. The beetles have continued to spread into the zone of defense in such numbers that the attempt to check their advance is hopeless.

* * * [Here Doctor Craighead noted the epidemic of the Great Basin tent caterpillar, discussed in this number of the Forest Worker by J. M. Miller.]

The spruce budworm (*Cacœcia fumiferana* Clem.) has been especially destructive along the Shoshone River just east of Yellowstone National Park on an area of over 100,000 acres and on the Santa Fe National Forest in New Mexico. In the southwestern corner of Yellowstone National Park along the Bechler River over an area of many square miles the lodgepole has been completely stripped by the spruce budworm. Although this insect has been recorded from pine before, such an extensive defoliation is unique.

A severe defoliation involving some 1,000 acres on the Lincoln National Forest, in the vicinity of Cloudcroft, N. Mex., occurred during the past season, supposedly being caused by a species of Ellopia. Douglas fir is the chief food plant.

An epidemic of the Black Hills beetle (*Dendroctonus ponderosæ* Hopk.) on the Colorado National Forest has completely subsided, owing to effective control measures.

Outbreaks of the southern pine beetle (*Dendroctonus frontalis* Zimm.) in the Southeast were extremely rare in 1928, as is usual in years of normal precipitation.

The hemlock looper (*Ellopia fiscellaria* Gn.) has been reported destructive in hemlock stands at a number of

points in New York, western Pennsylvania, and Ohio, although it is believed that it was not so abundant as in the preceding two years.

Again in 1928 there was heavy defoliation by Neodiprion dyari Roh. on the two and three needle pines in North Carolina in the vicinity of Asheville, and at points in Massachusetts.

The European birch leaf miner (*Phlebatrophia mathesoni* MacG.) was unusually abundant throughout portions of Maine during the past summer. This insect was more in evidence than it had been in any previous year.

The locust leaf miner (*Chalepus dorsalis* Thunb.) was again abundant in the Blue Ridge and Appalachian Mountains during the past summer.

Reports of damage by the larch sawfly (*Nematus erichsonii*) would indicate that it was probably not so abundant in 1928 as in other recent years.

The fir tussock moth (*Hemerocampa pseudotsugata* McD.) has again been reported as very destructive, even more so than in 1927, on the Humboldt National Forest, Nevada, and the Weiser National Forest, Idaho. This same species has appeared in considerable numbers in the neighborhood of Puget Sound, Wash.

Toumeyella numismaticum P. and McD. has been increasing on the Forest Service plantations of jack pine on the Nebraska National Forest, at Halsey, Nebr. Several acres of pine 14 to 15 years old has been killed, and it was necessary to initiate control measures last spring.

Rhyacionia frustrana Comst. has been recorded as locally injurious in New Jersey, Massachusetts, and Louisiana during the past summer.

The needle tyer (*Eulia* sp.) infestation in the southwest portion of the Yellowstone National Park, which has destroyed the lodgepole over many square miles, practically subsided within the last year.

Termites continued their serious damage to the woodwork of buildings in the Southeastern, Gulf, Central Western, and Southwestern States, as well as in California.

Tom Gill Makes Survey of Tropical Forest Resources

Tom Gill sailed December 8 on the second annual field trip of a survey of tropical forest resources which he is making for the Tropical Plant Research Foundation and the Charles Lathrop Pack Forestry Trust. Mr. Gill began this work in 1927 when he went through the West Indies, Venezuela, and British Guiana. His itinerary this season leads to Cuba, Mexico, and Panama and includes the Maracaibo Basin in Venezuela, where work could not be concluded last year because of a shipwreck. In Cuba he will confer with Government foresters and in Mexico he will be joined by the Federal forester in a field trip in the southern part of the country. This year, also, he will study the methods by which tropical timber is being exploited in British Honduras, one of the few countries where this is being done according to forestry principles. For 1929 the plan is to visit the valley of the Amazon.

One purpose of this survey is to find substitutes for certain of our own fast-disappearing hardwoods. It is directed toward the acquisition of a working knowledge of the extent of tropical forests in Latin America, the amount of commercially valuable timber they contain, and the purposes for which tropical species may be used. Reconnaissance is made partly by airplane, but mostly by muleback and canoe. Mr. Gill's party usually consists of a guide, an interpreter, and about 20 Indians. Very often progress must be exceedingly slow because of the difficulty of cutting a way through the underbrush. The party must not be burdened with food supplies, and consequently subsists largely on game and wild fruit.

When an unidentified species apparently of commercial value is confronted, specimens are collected of the leaves, of the flowers and fruit if these are available, and of the heartwood. These are sent to the Yale Forest School for identification. Logs of the species apparently of greatest importance are sent out of the forests by pontoon or canoe to seaports and thence shipped to the United States to be tested. The tests of this timber, to determine its suitability for various uses, are made at the School of Forestry and Conservation, University of Michigan. Numerous photographs are taken, illustrating species characteristics and forest conditions. Economic information is collected from official sources—from commercial attachés and when possible from government foresters—and local uses of native timber are studied.

A fundamental difficulty in studying tropical forests is the chaotic condition existing as to common names of the species. One species may have as many as 20 local names, and often one species is supposed to consist of two or three.

Wherever he has gone in the Tropics, Mr. Gill says, he has found North American lumber—southern pines, Douglas fir, and redwood—being sold in the lumber yards in preference to local species, this not because of inferiority of local species but because of the absence of any organized lumber industry. The logging methods usually practiced in tropical regions of the Western Hemisphere are wasteful, uncertain, and expensive. Although it is generally true that the forests of these regions contain a great complexity of various species, Mr. Gill says, species known to be valuable do occur in almost pure stands of wide extent. Where this condition exists, logging is commercially possible. Where large numbers of species occur in mixture, commercial exploitation will probably have to await further study of the possible uses of many of the species. The present highly selective system of logging, removing only 2 or 3 per cent of the stand, makes for unjustifiably high logging costs.

Light Intensity and the Growth of Plants

By Hardy L. Shirley, Boyce Thompson Institute for Plant Research (Inc.)

Things the forester needs to know about the rôle played by light intensity in the forest include not only what light intensity is needed by plants for survival but how the growth rates of plants are affected by the variations in intensity that occur in natural plant habitats, whether different species of plants differ as to the light intensity they require for survival, and whether they differ in their response to increments of light. Particularly is the forester concerned with finding what light intensity plants require for vigorous, healthy growth.

In a study of plant reactions to different light intensities carried out at the Boyce Thompson Institute for Plant Research, Yonkers, N. Y., plants were grown under cloth shades, both in the greenhouse and outdoors. In order that temperatures and humidities might be kept uniform, each shade was provided with forced ventilation. Tests were made with light intensities varying from 1 to 100 per cent of full sunlight. The amount of dry matter produced by the plants was taken as the criterion of their growth.

The light intensities found to be required for survival by most of the plants studied ranged from about 0.5 per cent to about 1 per cent of full sunlight. With 1 per cent intensity sunflowers failed to survive, while Galinsoga and avens survived and showed some increase in dry weight. Loblolly pine subjected to 1 per cent intensity survived for five months, but made very little gain in dry weight. Redwood plants with light of 1 per cent intensity survived seven months but then began to die, the dry weight of those surviving after the 7-month period being only slightly greater than it had been when the plants were first placed in the shade.

With only 1 per cent of full sunlight several plants such as buckwheat, Galinsoga, avens, and hog peanut were able to survive for a considerable period of time but were not able to produce fruit. On buckwheat and Galinsoga a few flowers were formed.

Dry matter produced by the plants during the winter was in most cases almost directly proportionate to the intensity of the light they received. During the summer under outdoor conditions a decrease to 50 per cent of full sunlight caused only a slight decrease in the growth of many plants. At 20 per cent of full sunlight, growth of most of the plants was considerably reduced.

Redwood grown outdoors showed maximum increase in dry weight at 50 per cent intensity, avens at 75 per cent intensity, and loblolly pine at 100 per cent intensity. When exposed to full summer sunlight, plants of all three species appeared to be stunted and developed considerable red pigment in the leaves, while those under shade showed the normal green color. Plants grown under shades in the greenhouse at the same time showed maximum increase in dry weight under the highest intensity available, 70 per cent of full sunlight. The higher temperature of the greenhouse seems to have been an important factor in the utilization of intense light.

For all plants studied, root development was greatest under the highest light intensity available. With variation from 20 to 100 per cent in light intensity, the ratio of dry weight of root to dry weight of top varied for redwood from 0.33 to 0.84, for loblolly pine from 0.11 to 0.42, and for avens from 0.37 to 0.84.

Optimum height growth of most of the plants studied occurred during the summer at a light intensity of 20 per cent—less than that at which optimum production of dry matter occurred. A further decrease in light intensity caused a decrease in the rate of height growth due to insufficiency of food supply.

Light measurements made in a hardwood stand near the Boyce Thompson Institute for Plant Research showed variations from 16 per cent in sun flecks to less than 1 per cent in the shade of 60-year-old yellow poplars. A dense stand of sumach allowed only 2 per cent of the light to pass through. Light measurements under a pine stand at Keene, N. H.—not a dense stand—showed from 2 to 6 per cent intensity.

These studies indicate that the light intensity under ordinary forest canopies is usually so low as to be a decidedly limiting factor in the rate of growth of the under vegetation. Different species have different light requirements for survival and show different growth responses to increments of light. There are great differences, also, in the length of time different species can survive under intensities too low for growth.

Before the results of this work are applied to silvicultural practice, light-growth curves should be worked out for the species concerned and more measurements of light intensity should be made in the forest. It may be suggested that from the standpoint of light economy an acceptable system of forest management is the group shelter-wood system.

Physical Effect of Wind on Plant Growth

Results of a preliminary experiment to determine the physical effect of high winds on plant growth are reported by H. H. Finnell, director of the Panhandle Agricultural Experiment Station, Goodwell, Okla., in the Journal of the American Society of Agronomy. Two potted marigold plants were placed in front of a 12-inch electric fan, at a distance of 80 centimeters, and for 60 days were exposed to a wind having a velocity of about 15 miles an hour. Two plants that had been potted under the same conditions with the test plants and that appeared to equal them in foliage area and total height were placed in the same room but about 80 centimeters behind the fan, where the air was comparatively still. All pots were brought back daily to optimum moisture content, previously determined by repeated tests.

Difference in rate of growth between exposed and check plants was measurable at the end of the first 24 hours. The exposed plants showed an actual loss of leaves, deformation of the main stem, and a curled and withered condition indicating that considerable repair of tissues was required. At first the wind-exposed pots used considerably more water, but near the thirtieth day the check plants had so far outgrown those exposed to the wind that they were using approximately the same amount of water as the latter, and they continued to do so to the end of the experiment. The number of secondary branches formed was apparently increased 42.8 per cent by the wind. The percentage of dry matter was found to be consistently higher in all parts of the check plants, presumably owing to the fact that they reached a more advanced stage of maturity rather than to any morphological modification from the effects of wind. Exposure to wind apparently postponed maturity about 10 days in a 60-day growing period.

After the exposed plants reached a height of 50 centimeters, which lifted the growing parts out of the main air draft, they resumed normal growth.

Great Basin Tent Caterpillar Becomes Epidemic

By J. M. Miller, United States Bureau of Entomology

During 1928 unusual defoliation by the Great Basin tent caterpillar (*Malacosoma fragilis* Stretch) ocurred in northern California and southern Oregon. The host plants of this insect consist mainly of species that compose the brush cover of the forest regions on the eastern slope of the Sierra Nevada and Cascade Mountains. Over large areas the brush cover was completely stripped, and in certain regions a serious loss of sheep forage resulted.

The caterpillars appeared in large numbers during the early part of the summer season. They ate almost every species in the brush cover, feeding upon ceanothus, wild cherry, wild gooseberry, wild currant, aspen, squaw carpet, wild rose, willow, and manzanita. Western chinquapin seemed to be the only plant of low shrubby growth that they passed up.

On July 9 the caterpillars in the vicinity of Truckee, on the Tahoe National Forest, were found to be transforming to pupæ, the feeding period being practically closed. They had spun numerous web tents on the plants on which they had fed. Many of the caterpillars spun their cocoons within these tents, but numbers scattered over the brush and spun their cocoons singly. Many caterpillars were found dead, probably of some bacterial disease. Occasionally a cocoon was found on a conifer, where an isolated caterpillar had climbed up on the foliage to pupate. There was no evidence of feeding on coniferous trees.

Moths were observed flying on the Modoc National Forest on August 12. General emergence everywhere was apparently over by August 15. Egg masses, deposited in bands half surrounding the twigs, were in evidence soon after the flight period started.

William Zeh, lumberman of the Indian Service, reported on July 5 as follows:

In the northeastern portion of the Klamath Indian Reservation I noticed that all the bitter brush (*Purshia tridentata*) was defoliated by some tent caterpillar. This infestation then seemed to take in several of the townships extending around Wocus Bay. As this browse is the principal sheep feed on the reservation, the defoliation is working a considerable hardship on some of the sheepmen. The caterpillars did not even spare the manzanita, the ceanothus, or certain Ribes, but in places where the infestation was lighter only the Purshia tridentata was defoliated.

J. F. Kimball, of the Klamath Forest Protective Association, also reported the loss of $5,000 in revenues from sheep grazing on timber lands belonging to the association in southern Oregon.

There is no evidence that the brush cover will be killed as the result of one seasonal defoliation. It still remains to be seen whether these caterpillars will appear in sufficient numbers in 1929 to cause noticeable defoliations again. Such epidemics are usually short-lived, and a subsidence of the caterpillars can be expected in another season. Reports indicate that similar outbreaks occurred about 1920–21 and 1914–15.

A Forest Plantation in Ohio

In the last three spring planting seasons 300 acres have been reforested by the Marsh Lumber Co., Dover, Ohio, with the planting of about 300,000 trees. When examined during the past summer the plantations showed a survival of more than 80 per cent in nearly every portion and more than 90 per cent on some sites. Scotch and Norway pines have given better results than any other pines and the most successful hardwoods have been black walnut, white ash, black locust, yellow poplar, and sugar maple. Northern white pine, Norway spruce, and European larch have been found unsuitable to this particular planting site although they are doing fairly well elsewhere in the same county. The Marsh company reports that on its property trees planted in plowed furrows have shown very little advantage in early survival over trees set directly in the sod.

Trees are being planted by the Youngstown, Ohio, Federation of Women's Clubs along the road from Youngstown to Boardman, as a memorial to the Youngstown men and women who lost their lives in the war. In 1924, 300 American elms were bought by the federation and planted in a grove from which they are being taken and set out as fast as the road grading permits.

Adverse Weather Augments Injury to Trees

By F. C. Craighead, United States Bureau of Entomology

During the past summer my attention was attracted by the great quantity of dead and dying incense-cedar reproduction on the Lassen, Plumas, and Modoc National Forests, in California. This condition was not confined to the east side of the Sierras; similar dying was reported to be prevalent on the Eldorado National Forest, particularly around Placerville, and on the Sequoia National Forest near Springville. On the areas that I examined these dead and dying trees varied in height from 1 to 6 feet. Occasionally a much larger tree was found dead, probably from a different cause. The local distribution of the affected trees was extremely erratic; occasionally a single affected plant would be found surrounded by healthy ones, but more frequently a clump of several plants or practically all individuals in a group of reproduction were dead or dying. Likewise there was no uniformity in the appearance of the dead and injured trees. Some had yellowed foliage, indicating recent death; others were entirely brown; and again some had no foliage, indicating that death had occurred a year or so previously. In most cases the plant was not entirely dead, the lower branches near the surface of the ground being still green. Occasionally only the top was affected.

On the Modoc National Forest some of these trees were examined. They were found to show only one consistent indication of injury, a scar or lesion from 2 to 3 inches long at the junction of the dead and living portions. This scar in most cases was two or three years old and had partially healed over. In some instances the healing was almost complete. The scars appeared to have been caused by some injury resembling sunscald or tramping or nipping by grazing animals. It was found, however, that in a number of cases—and this may be true of all—an incision had been made by one of the periodical cicadas in ovipositing. This cicada apparently was quite abundant on the Modoc two or three years ago.

Whatever the reason for the initial scar, the ultimate death of the tree or branch undoubtedly can be attributed to circumstances similar to those causing "red branch" of fir and "spike branch" of spruce in the Northeast. This characteristic injury of the fir and spruce in the northern forests has been traced to an initial feeding scar made by species of Monochamus and the subsequent drying out of the distal portion of the twig. To quote Doctor Faull: [1]

The most frequent cause is a combination of two factors, namely, insect gnawing of the bark (which is almost invariably restricted to the lower surface and is by no means a girdling) and the subsequent "drying out" of the living tissues at the same level, a process that is favored by the action of frost and by the inactivity of these tissues during the fall and winter.

The same combination of causes explains the occasional conspicuousness of pitch-moth (*Pinipestis* sp.) injury on the Forest Service plantations at Halsey, Nebr. During the spring of 1928 the tops of a great number of Austrian and Scotch pines in these plantations turned brown. An examination in June showed that in all cases the affected trees had been partially girdled by pitch moth from one to four years previously. The low temperatures and high winds of the winter of 1927–28 undoubtedly had proved the undoing of many of these trees, which otherwise might have completely healed these scars in a few more years.

Unquestionably it is for the same reason that porcupine damage shows up more conspicuously some years. Tops that have been partially girdled are able to maintain growth until unusually adverse weather conditions arise, causing excessive desiccation.

[1] Faull, J. H.: Report of the Minister of Lands and Forests, Province of Ontario, 1922.

Federal Action Urged to Check Larch Canker

Action by the Federal Government to stamp out the European larch-canker disease is urged upon Congress in a resolution signed by representatives of the Forest Research Council of the Pacific Northwest, the forestry committee of the Portland (Oreg.) Chamber of Commerce, and the West Coast Lumbermen's Association. The resolution was adopted at a meeting held in Portland October 25, after an address by Dr. Haven Metcalf, chief of the office of forest pathology, Bureau of Plant Industry. Doctor Metcalf explained that a serious menace to Douglas fir, western yellow pine, and other valuable timber species of the West is involved in the appearance of the larch canker in Massachusetts and Rhode Island. The disease may spread to the West either by direct importation or by slow migration through the northern tamarack belt, which is continuous from the Atlantic coast to western Alberta. In the Northeast it has been found only on planted trees and on the native tamarack, which is economically unimportant. Because of the absence of valuable forests of its host species in the East, Eastern States and property owners have no immediate incentive to undertake its control. The Federal Government has no authority to destroy the infected trees, and as yet Massachusetts and Rhode Island have not acted to stamp out the disease or to prevent its spread from their borders.

In Europe, where it has been known for a century, the larch-canker disease kills some trees and disfigures many, but is not serious enough to exterminate the larch. It has been found on Douglas fir and Sitka spruce in Europe. The disease has no alternate hosts, and Doctor Metcalf states that he can not imagine any possible control measures by which it can be stopped if it once gets into the western forests. He estimates that it will kill a large tree in 10 years.

Little Falls Municipal Forest

By R. R. Fenska, New York State College of Forestry

As far back as 1896 the city of Little Falls, N. Y., was purchasing lands with the view of ultimately controlling the watershed of the neighboring Spruce and Beaver Creeks. To-day the water supply of this city of 14,000 population is protected by municipal ownership of 4,003 acres of land at the headwaters of the two creeks.

The following summarizes the present forestry conditions on this municipal watershed property:

	Acreage
Mature timber (selection forest of mixed hardwoods and softwoods)	1,200
Immature timber (mixed hardwoods and softwoods)	1,100
Plantations (pine and spruce)	845
Nonforested land	858
Total	4,003

Up to 1927 the 1,200 acres of mature timber was a very lightly culled forest of spruce, balsam fir, hemlock, yellow birch, maple, and beech. A careful cruise showed that it was about two-thirds hardwoods. The spruce, the most valuable element in the stand, averaged 15 to 20 inches in diameter at breast height and was of high grade. A large percentage of the hardwood timber was mature and averaged 20 inches D. B. H.

In 1926, under the direction of a forester, 5,000,000 board feet of timber, including both softwoods and hardwoods, was marked for cutting. This timber was so selected that its removal will not in any way impair the value of the area as a protection forest. Logging began in the fall of 1927 and will continue until the spring of 1929. The timber has been sold to a concern specializing in high-grade lumber for piano sounding boards. The revenue from the sale will reimburse the city for the purchase of the land and timber.

The contract under which this timber is being cut is similar to the contracts under which the United States Forest Service sells national forest stumpage. Young reproduction already on the ground, together with the seed in the duff, will insure rapid regeneration on the areas left open by the cutting of merchantable trees. To increase the percentage of spruce in the new stand all skidding and hauling roads will be planted in the spring of 1929 with spruce transplants.

The 1,100 acres of immature timber will be ready for a selection cutting in about 28 or 30 years.

During 1928 a quarter of a million trees were planted on open portions of the Little Falls forest. Since 1916 there has been established on the forest a total of 845 acres of forest plantation. The species planted are northern white, Norway, and Scotch pine and red and Norway spruce, with a few northern white cedar, black locust, and Carolina poplar. The average cost of reforesting these 845 acres has been $10 per acre. The plantings made during 1927 cost only $8 per acre. The plantations, now ranging from 1 to 11 years in age, are all in a thrifty condition. The older pine plantations average from 20 to 25 feet in height.

The present program calls for the planting of from 150,000 to 250,000 trees each spring until the remaining 858 acres of abandoned farmland are reforested.

Denver Plants Trees on Watershed Areas

A watershed-protection program initiated by the Denver, Colo., Chamber of Commerce three years ago has resulted in the planting of about 20,000 western yellow pine seedlings on watershed areas close to the city. The work has been carried on with the cooperation of various young people's organizations. In May of 1928, for example, 2,000 seedlings were planted by boys of the Order of De Molay in Red Rock Park; 1,000 by the boys of the senior class of Manual Training High School, in Dicks Park; 1,000 by the Camp Fire Girls, on Inspiration Point; and 1,000 by the Garden Club of Denver.

The three years' plantings, which have been made in various locations and under varying conditions, show an average survival of about 65 per cent. These results have encouraged the forestry committee of the chamber to develop a program of planting for the whole of the city's watershed.

Slash Pine Seed Collected in Abundance

Slash pine seed were collected in South Carolina, Georgia, and Florida last fall more easily and cheaply than ever before. The cones were unusually abundant and were gathered without difficulty from trees thrown by the tropical storm. The Georgia State College of Agriculture collected a quantity of the seed, chiefly in order to help farmers get supplies at low cost. Seed dealers and owners of timberlands took advantage of the extraordinary crop to collect large quantities of the seed of this tree which possesses remarkable qualities of rapid growth, high grade of wood, and large yield of crude turpentine—and which is propagated from seed as easily, and may be set out as successfully, as cabbage or tobacco. Slash pine is native to the coastal plain region from South Carolina to the Mississippi River. It appears to be adapted to the maritime portions of North Carolina, of western Louisiana, and of southeastern Texas.

In a 4-year-old plantation of Scotch pine on lands of the Rockhill Coal & Iron Co., Huntingdon County, Pa., many trees grew 36 inches in height in the 1928 growing season. The average height growth for the plantation in that year is reported by the company's forester, De Lanson Lenhardt, as 23 inches.

A plantation made by this company in 1921 is of pitch pine and northern white pine in mixture by rows. The mean annual height growth of the pitch pine is shown by recent measurements to have been 14.2 inches, that of the white pine 10.5 inches.

A Forest-Fire Torch

A torch specially adapted for use in back-firing, in burning slash, or in burning out mossy trees has been put on the market by the manufacturer of a railway signal fusee that was recently tried out in forestry work by organizations cooperating with the Pacific Northwest Forest Experiment Station. Reports by foresters in the Northwestern States and in British Columbia who took part in these tests, summarized in the FOREST WORKER of May, 1928, stated that the fusee was found satisfactory in igniting light materials such as grass, needles, and duff under fair to good burning conditions; was decidedly more satisfactory than matches or pitch splinters; and was found exceptionally convenient in that it is easily carried and may be gotten into action very quickly, provides light in back-firing at night, and requires no matches. The standard railway fusee was found not to provide the volume of heat required when fuels are damp or where relatively little fine material is present, and did not prove effective in igniting logs and similar coarse material.

In line with the suggestions arising from these trials the manufacturer has made the following modifications in the railway fusee to produce a "forest-fire torch": The caliber has been increased to seven-eighths inch; the volume of flame is increased 36 per cent; the temperature of the flame is above 2,000° F.; the burning time is more than 10 minutes; a tin ferrule handle (in place of the spike) has been provided for insertion of a stick when one is needed for a handle; and smaller containers are used, for convenience of issue and transportation.

The torches can be supplied packed in lock-corner wooden boxes of 24 or in larger cases holding six small boxes of 24 each.

Five hundred United States marines and seamen assisted in fighting the disastrous fires that occurred in 1928 on the Cleveland National Forest, Calif. An offer of the services of 100 British seamen was received from Vice Admiral Cyril T. M. Fuller, Royal Navy, commandant of the American-West Indies Squadron.

A tract of virgin timber on the outskirts of the borough of Clarion, in western Pennsylvania, has been dedicated to perpetual use as a public park or forest. This tract of 30 acres, known as Wilson's Woods, was donated by S. W. Wilson. It is owned and managed by the Clarion Forestry Association, which was incorporated primarily for this purpose.

Some Growers of Christmas Trees

Raising Christmas trees has turned out to be more profitable than dairying in the experience of a landowner at Pocono Lake, Pa. Since beginning to raise the trees on a large scale this man has reduced his 35-head dairy to 7. A fair share of the trees produced on the 2,400 acres that he devotes to the purpose have come from a native red spruce swamp, but the majority have been planted in the fields. Most of the fields are covered with sod. The sod has not interfered with the growth of the evergreens, consequently cultivation has not been necessary.

A landowner near Reading, Pa., has successfully raised Christmas trees on 1,000 acres of rough, stony ground where hardwood reproduces rather rapidly. Here it is necessary after setting out the young trees to go through the area once or twice during the first three seasons of the trees' growth in the field and cut the young oak, maple, beech, and birch reproduction that is inclined to take possession of the ground before the young evergreens become established.

The owner of an 80-acre farm of high-priced land near Lionville, Pa., has had his land in no other crop than Christmas trees for the last 20 years.

L. H. Buzzell, of Elkins, W. Va., after visiting these three plantations last summer determined to make Christmas-tree growing the sole activity on his farm, Extension Forester Skuce reports. In the spring planting seasons of 1927 and 1928 Mr. Buzzell had already planted 60,000 Norway spruce and Norway pine.

An Early Conservation Measure

Block Island, a part of Rhode Island lying about 9 miles off the south coast of the mainland, was settled in 1661 by 16 people from Braintree, Mass. Early historical references indicate that it was fairly well covered with such trees as oak, elm, ash, pine, hickory, cedar, and alder. Wood was the only material used for fuel. As the land was cleared for farming, it appears, some scarcity of timber developed. In 1721, when there were perhaps 30 families on the island, one Simon Ray proposed that in order to conserve wood an article be enacted in the town warrant limiting the height of fences to 4 feet. Of the people present at the town meeting at which this was proposed 17 voted yes and 4 no.

The national parks had 2,522,188 visitors during the travel season of 1928, or 167,545 more than in 1927.

Foreign Notes

Large Plantings in New Zealand

Forest plantings in New Zealand in 1927 covered 78,380 acres, more than doubling the 1926 record, according to a report of the American trade commissioner. The State forest service added nearly 4,000 acres to its record of the previous year by planting 19,924 acres in 1927, and the farmers' quota rose from 2,800 acres to 7,040 acres. The tree-planting companies and syndicates, after not quite matching the State plantings in 1926 with 15,826 acres, broke away in 1927 to establish a total of 49,824 acres.

The commercial tree-planting organizations whose development features the prodigious growth of the afforestation movement in New Zealand since 1923 are formed on two different plans. The first plan is that of the joint-stock company, under which the forest property is vested in the company and shares of the profits are received by shareholders according to the amount of capital they have contributed. Under the second plan the investing public do not become shareholders; the company contracts with each investor, for a certain cash payment, to convey to him at the end of a given term a certain area of land planted according to a prescribed agreement. The interests of the investors are watched over by trustees appointed by them, and the lands concerned are conveyed by way of mortgage to the trustees until the time for conveyance to the investor arrives.

A recent report from the American consul in Wellington states that the State forest plantings in the year 1927–28 totaled about 35,000 acres.

Reclaiming Waste Land with Forest in Holland

In the region of the Peel in Brabant (Netherlands) reclamation of about 40,000 acres of sand and marshland has been undertaken since 1900 by the Nederlandsche Heidemaatschappij. First, roads were built across the region, then the country was drained by means of ditches and canals. After the surplus water was drawn off, the parts of the region to be devoted to forestry and to agriculture were chosen. On the areas chosen for forestation 2-year-old Scotch pine was planted 16,000 to the hectare, or pine seed was sown at the rate of 4 kilograms to the hectare.

First thinnings are made at 15 to 20 years, and additional thinnings every 4 years thereafter. Slash from the thinnings is scattered. The mines of Limbourg are near by and there are neighboring regions without forest, so that the products derived from the thinnings have a good market. The plantations when visited in 1928 were in very good condition and were contributing to the economic transformation of a large region.

In some places American oaks have been used successfully for planting. They have done well even as an understory to Scotch pine. On the good soils, however, beech and fir are used for the understory. The oak, beech, and fir are sowed, and across the sowed strips 2-year-old Douglas fir and Japanese larch are planted, the idea being eventually to obtain a mixed forest of these species and Scotch pine, or at least in the first rotation to get soil improvement and make natural regeneration of the pine possible.

Forest Planting in England and Wales

Sixteen thousand acres were planted with forest trees last spring by the British Forestry Commission in England and Wales, according to a London correspondent of the Timberman. Since 1920 the commission has planted 80,000 acres. In its various nurseries 87,000,000 seedlings are now lined out, and 44,000 pounds of hardwood seed and 5,000 pounds of conifer seed were sown last spring. For all plantings of native species, including Scotch pine, the commission does its own seed collecting and extracting. Seed of Douglas fir and Sitka spruce and a few other nonindigenous species are imported.

Thetford Forest, Norfolk, the largest unit controlled by the commission, has now grown to 26,500 acres, and about half of this acreage has been planted. Here is located the largest forest nursery in the country, in which the commission raises more than two-thirds of the conifer plants it requires. The forest has its own sawmill and creosoting works.

At Thetford Forest, it may be remembered, the Government is developing a scheme of forest workers' holdings. Units of about 10 acres each, with houses and farm buildings, are rented to men to whom the Government guarantees 150 days' forestry work a year. One hundred such holdings have been established at Thetford Forest, and the number is soon to be increased to 130. At the busiest periods, November to March and June to August, from 300 to 400 men are employed on the forest. Similar centers of afforestation are being developed at Allerston, in Yorkshire; at Hamsterly, in Durham; at the Mortimer Forest on the Shropshire and Radnor borders; and at several points in north Wales.

Mechanical Sower for Small Pine Seed

At the instance of Messrs. Massart and Misson of the Administration of Forests and Waters of Belgium a successful mechanical sower has been constructed for the planting of Corsican pine seed. This machine, which is described by M. Misson in the July, 1928, Bulletin of the Central Forestry Society of Belgium, has been tried out successfully and has planted at the rate of 1 to 1½ hectares per day, using 1 kilogram of seed per hectare. The planting is done in strips about a meter apart. Plantings made with this machine in the communal forest of Hechtel in April, 1928, resulted in a full stand of seedlings.

The seed are distributed through the rotation at the bottom of the seed reservoir of a wooden wheel, 4½ centimeters in thickness and 13 centimeters in diameter, on the circumference of which are seven notches each designed to pick up a single grain at every revolution of the wheel. This wheel is turned by means of a chain attached to the hind wheel on which the apparatus is mounted. The hind wheel is 1 meter in circumference, so that the seed are planted at the rate of seven to the meter. Two rubber brushes, one at each end of the reservoir, push the seed against the wooden wheel. A small plowshare placed just in front of the funnel which discharges the seed makes a furrow about 1 to 1½ centimeters deep and a moldboard placed laterally pushes the soil over the seed. The hind wheel, which is large and heavy, acts as a roller. The machine weighs only 25 kilos and can be drawn by one man. Although constructed for the sowing of Corsican pine it can be adapted for sowing other species.

Spark Arresters Not Enough

British Columbia loggers are warned by the forest branch of the Province against putting too much faith in spark arresters. In 1927 the branch made a study of the operation of various types of spark arresters in use on donkey engines in a number of representative logging camps. and found that any one of them would emit sparks which, under favorable conditions, would start fires. The study points to the necessity of keeping the area immediately surrounding the spark arrester wet down when operating in dry weather, especially during periods of low relative humidity, and to the necessity of keeping close watch on the physical condition of the arrester.

From 1900 to 1927 the French Government authorized the clearing of about 21,000 hectares of land and reforested 86,000 hectares. In addition 50,000 hectares of private land and about the same area of communal and other public land were reforested through the aid of Government subsidy.

Reproduction on Spruce Lands Cut Over for Airplane Stock

More than 1,000 young trees per acre are growing on most of the land on the northern coast of British Columbia that was logged during the war for airplane spruce, it appears from the results of a study made in 1927 by the British Columbia Forest Branch. Careful tallies were made on 60 representative areas on the Queen Charlotte Islands and in the Ocean Falls district, and a less intensive check was made on about the same number of areas. The data indicate that there are more than 1,000 seedlings per acre on 68 per cent of these cut-over lands, and more than 500 seedlings per acre on 80 per cent of them. The areas studied have been almost free from fire.

Spruce was found to compose 31 per cent of the reproduction on these lands, hemlock 38 per cent, and cedar 31 per cent. It is thought likely that as the stands become older the superior vigor of the spruce will enable it to crowd out some of the slower-growing hemlock and cedar.

Canadian Pulp and Paper Output

Exports of pulpwood, pulp, and paper from Canada in 1927 brought $192,336,435 into the country, the Dominion department of the interior reports. Only $12,877,071 worth of pulp and paper goods was imported into the Dominion during the year. Paper remaining in Canada for home consumption amounted to about 529,000 tons and was valued at $38,807,861. The net value created in the utilization of the pulpwood averaged $38.98 a cord.

Paper Pulp from Bamboo

The suitability of bamboo for pulp manufacture was demonstrated by the Forest Research Institute, Dehra Dun, India, through tests on a semicommercial scale begun in 1923 and continued for four years. The results confirmed those of earlier laboratory experiments by indicating that it is not necessary to reject the nodes; that all the predominant species but one, and culms of different ages, can be mixed indiscriminately for chemical treatment; and that uniform yield and quality of pulp can be obtained by adopting the fractional system of digestion combined with the sulphate of soda method. Bamboo fiber was demonstrated to be suitable for all classes of paper, from brown kraft to high-class writing paper. Experiments indicated also that bamboo pulp is suitable for the manufacture of artificial silk and, in fact, for industrial applications as varied and extensive as those of wood pulp.

The bamboo forests of India and Burma cover thousands of square miles and are capable of yielding several million tons of pulp per annum.

Forest Protection Against Torrents and Avalanches in the Pyrenees

To protect the lines and stations of two railroads between France and Spain through the Pyrenees, the Spanish Forest Service has been carrying on extensive reforestation and engineering works. The site of the works is very unfavorable to the establishment of tree growth, but the need was judged sufficient to warrant heavy expense. It is the opinion of those engaged on the job that the engineering works "have only a transitory character" and that the only permanent remedy lies in reforestation; that reforestation is the only remedy against "flying avalanches," the formation of which is completely stopped by forest stands; and that the forest once established will not require maintenance but will be capable even of producing a revenue. Flying avalanches are those formed of great masses of powdery snow carried by the wind like waterspouts at sea.

At elevations above 1,600 meters in this region the growing season is only from mid-July to the end of October. Consequently the annual growth is small. And some of the planted trees are lost because of the weight of the snow, the fall of rocks, and the passage of avalanches. At these elevations mountain pine and larch were planted; at lower altitudes Scotch pine, Austrian pine, Banks pine (jack pine), fir, and spruce were used. Willows were planted in the eroded places and other hardwoods on the borders of ditches and roads. Old sprouts of beech were cut and natural regeneration of boxwood and hazel tree was encouraged. In planting 110 hectares 3,850,000 young trees were used, 5 trees being planted together in a spot.

The engineering works established along with this reforestation consist chiefly of masonry barrages or barrages of dry stone and fascine work constructed to check the flow of water in torrents or the sliding of snow in avalanches. Also roads have been built across the drainage so as to check avalanches.

Forest Area of the British Empire

The total forest area in the British Empire is 1,910,000 square miles, according to reports presented to the British Empire Forestry Conference recently held in Australia. Merchantable timber stands cover 624,000 square miles. Only 214,250 square miles is definitely dedicated to timber production. The total timber stand is 386,300,000,000 cubic feet, almost evenly divided between softwoods and hardwoods. The annual cut is about 3,600,000,000 cubic feet, 55 per cent being softwoods. The three Governments of Great Britain, South Africa, and New Zealand planted 89,000 acres of forest in the fiscal year 1928, as compared with only 23,000 acres in 1923.

Plans of Belgian Nature Protection Committee

The Belgian Committee for the International Protection of Nature, established unofficially in 1925 and incorporated with the approval of the Government in February, 1926, aims through publicity to create in Belgium a movement to improve and protect the beauty of parks, forests, and public gardens and to provide legislative measures that will promote this policy; and through research, educational propaganda, and cooperation with similar institutions in other countries to preserve botanical and zoological species threatened with extinction. The committee has already influenced the Government to create several large natural parks in the Congo and has brought about improved hunting regulations and other measures protecting the fauna of the Congo. As a basis for establishing a judicious forest policy in the Congo the committee has undertaken to collect data that will permit the publication of a forestry chart of tropical Africa in general, and the Congo in particular, and to compile all available information on the forest policies adopted in other countries and the results obtained through these policies. The committee proposed at the end of 1928 to begin publication of a periodical devoted to questions pertaining to the protection of fauna and flora. For this purpose it decided to create a separate organization known as the Office International de Documentation et de Corrélation pour la Protection de la Nature, which will be located in Brussels until the International Congress of 1930 at Amsterdam.

Institutions enrolled as members of the committee include the following: Société Royale Zoologique de Belgique, Société Royale Botanique de Belgique, Musée Royal d'Histoire Naturelle de Belgique, Jardin Botanique de l'État, Cercle Zoologique Congolaise (Musée du Congo Belge, Tervueren), Laboratoire Zoologique Torley-Rousseau (Universite de Bruxelles), and Saint-Hubert Club de Belgique. The president is Edm. Leplae, president of the Scientific Association of Agriculture in Tropical Countries, professor at the University of Louvain, and general director of the Agricultural Department of the Ministry of Colonies. The general secretary is J. M. Derscheid, F. Z. S., secretary for Europe of the International Committee for the Protection of Birds.

In the Parana Delta of Argentina there are more than 100,000,000 planted cottonwood trees. These are handled on an average rotation of 10 years. Their total value, not counting the land, is estimated at 300,000,000 pesos (the Argentine peso is the equivalent of $0.965).

Why Are the Russian Steppes Treeless?

As in the case of the American prairies, many reasons have been advanced to explain why there is so little tree growth on the steppes of southeastern Russia. In this region, which extends north from the Caucasus Mountains over distances ranging beyond 500 miles, tree growth is largely confined to river banks and ravines. The main factors militating against the occupation of the steppes by forests, according to the views of various Russian foresters and ecologists, have been formulated as follows by Boris A. Keller, professor at the Agricultural College, Vorónezh:

1. A lack of moisture, in conjunction with the characteristic fine-grained steppe soil. On the steppes, as compared with the forest, precipitation is lower by from 4 to 8 inches, more of the water is lost to the soil through immediate evaporation as a result of the strong winds, penetration to the deeper layers of the soil is hindered by the fine-grained nature of the surface, and the water that does penetrate can not be so completely utilized by the root systems.

2. The characteristically strong steppe winds, with their direct influence on transpiration. Wind is, in general, the greatest enemy of trees, and not only the dry southeast winds of summer but probably also the winter winds have a great influence in preventing the spread of trees over the steppes, as over the northern tundra. Even in the leafless state trees may lose considerable quantities of water.

3. The presence of large quantities of easily soluble salts harmful to forest vegetation. Alkali areas occurring in the forest are usually barren of tree growth, and trees adjacent to them are dwarfed, of poor growth, and usually with much dead wood in the top.

4. Probably, competition with grasses. Sowings of tree seed in typical Stipa steppes have resulted in failure.

In the drier parts of the steppe zone the distribution of forest corresponds closely with the distribution of moisture except in the region of transition from forest to steppe, where the forest invades the plateaus from the river valleys and can to a certain extent prepare conditions for its own successful advance. (Thus the wind has less effect on a close-set phalanx of trees than on isolated individuals, and snow collects along the edge of the forest. The snow water moistens and leaches the soil, leading to podsol formation. This, like the shade of the trees, is inimical to the grasses.)

In the northern steppe the advance of forest on steppe has been marked, but appears to have been limited by fire. The fire might have originated from lightning. It is possible also that fires were started to get early spring forage. Records show that fire was used by the Moscow Kingdom in order that the invading Tartars might not be able to find fodder for their horses.

"We can not regard the problem of the causes of the hindrance of the advance of forest on steppe as definitely solved," wrote Professor Keller. "The relative importance of the single factors has not been settled. Especially, little attention has been devoted to the different species of trees in this connection. The causes of the failure of the pine, for instance, to spread on to the steppe may be quite different from those hindering the advance of oak or aspen. Certainly trees exist or could be produced, well adapted to occupy steppe. Even in desert, such trees as Arthrophytum are able to invade. But the steppes are geologically recent and the available trees are few and are adapted on the whole to a damp climate."

Forest Planting in South Africa

The forest-planting program of the Union of South Africa has progressed rapidly in recent years. The objective of 10,000 acres a year has several times been surpassed by nearly 50 per cent. During the year ending March 31, 1927, the department of forestry planted 15,642 acres. On 86 per cent of this acreage conifers were used, chiefly P. pinaster, P. insignis, P. canariensis, P. Hamiltonii, and P. muricata. Some P. patula, P. taeda, P. longifolia, and P. caribaea also were set out. The rest of the plantations were largely of eucalypts. The Monterey pine continues to be a favorite. Trees of this species planted in South Africa have achieved heights of from 100 to 125 feet in 16 years' growth. Slash pine is coming to be highly regarded in certain situations. More than 40,000 pounds of tree seed was collected and sold during the year, a large part of this being Cedrus deodara and Acacia mollissima. For local use 23,000 pounds of Pinus pinaster seed was collected. Most of this seed came from plantations. Seed that proved to be fertile was collected from shortleaf pines 12 to 15 years old.

Rainfall and Rate of Tree Growth

Measurements of the annual growth rings of oak and yew trees in the Forest of Dean, England, supplied by E. G. Burtt and published in the Meteorological Magazine (London), were found to show no such distinct correlation between rate of tree growth and amount of rainfall as studies by Prof. Ellsworth Huntington of Yale have revealed in the case of the bigtree. The measurements were studied in comparison with a series of rainfall values for the Forest of Dean extending from 1820 to 1920, calculated by Dr. J. Glasspoole and expressed as percentages of the normal for the 35 years 1881 to 1915. The 200-year-old yew tree examined afforded very little if any evidence of a relation between growth in any one year and rainfall in that year. Data smoothed over 10-year periods gave some indications that heavy rainfall was inimical to the growth of the yew. Study of two oak trees revealed no definite evidence of relationship between rainfall and growth. Growth-rate curves for the oaks were far more irregular than the curve of the yew.

Stump Removal with Saltpeter and Fire

The public-works service in Indo-China has experimented in removing tree stumps with saltpeter and fire. The test was made at Dong-Me on about 5,000 stumps of 13 species. The trees (0.3 meter and more in diameter) are cut at 0.6 meter above the ground in June and July when the sap has risen. Immediately after the felling a vertical hole is made by means of an auger at the center of the cut surface and about 10 grams of saltpeter is dropped into the hole. The hole is then tightly plugged with a piece of wood. At the end of the dry season the stumps are surrounded with dry wood and brush, which is set afire. Though with some species the burning is not complete and the stumps have not been killed by the saltpeter, most of the stumps are consumed slowly and completely down to the ends of the roots. Stumps that were entirely consumed in the test were those that had no sprouts and appeared to have been killed by the saltpeter; those with sprouts were not consumed. The cost of the operation is small compared to that of removing stumps by the usual methods.

In 1928, as in 1927, Armistice Day celebration plans in France included the planting of trees. Departmental and communal authorities and veterans' associations cooperated in arranging for tree planting by school children, choosing sites in the vicinity of monuments dedicated to the war dead.

The Forests of Denmark

Only about 8 per cent of the area of Denmark is in forest or woodland, the total forested area being about 1,850,000 acres. Of this total about 18 per cent is State owned, 3 per cent is municipal property, and 7 per cent belongs to the Dune Inspectorate. More than one-third of all the privately owned woods, or about 250,000 acres, is in units of less than 150 acres. Beech and spruce are the prevailing forest tree species of Denmark, 41 per cent of the forest area being in the former type and 27 per cent in the latter. Oak stands occupy 5 per cent and other hardwoods 6 per cent of the forest area; the mountain pine, used in dune reclamation, covers 17 per cent of it.

The State forests are under the charge of a directorate that is responsible to the Ministry of Agriculture. They are divided into 30 districts having areas of from 2,000 to 8,000 acres, each of which is under the direction of a superintendent.

Canadian mills produced 212,177 tons more of newsprint in the first nine months of 1928 than in the corresponding period of 1927. This constituted an increase of 14 per cent in the Canadian newsprint production. During the same period the United States output was 88,063 tons, or 8 per cent less than in 1927. The total North American output increased during the period by 5 per cent.

Personals

Ralph F. Wilcox has been appointed State forester of Indiana, the position in which he has been acting since it was resigned by Charles C. Deam. Joseph F. Kaylor, forester in charge of nurseries, has been appointed assistant State forester.

W. G. Wahlenberg has resigned as assistant silviculturist at the Southern Forest Experiment Station, effective March 1, in order to accept a position as forester with the Eddy Tree Breeding Station, Placerville, Calif.

Justus F. Muller has taken the position in the department of zoology, Roosevelt Wild Life Forest Experiment Station, from which Alvin G. Whitney resigned to join the faculty of the School of Forestry and Conservation, University of Michigan. Doctor Muller received the A. B. degree from Johns Hopkins University and the A. M. and Ph. D. degrees from the University of Illinois. He has served as scientific assistant with the United States Bureau of Fisheries and the Natural History Survey of Illinois.

H. H. Tryon, formerly extension forester of South Carolina and now forester of a 4,000-acre estate near Cornwall on the Hudson, N. Y., owned by Dr. E. G. Stillman of the Rockefeller Foundation, reports that he is developing what promises to be a splendid example of two-storied hardwood forest. The estate offers an opportunity, Mr. Tryon says, for studies of forest growth such as have never been carried out in the region with the exception of some preliminary work done by Roy L. Marston 20 years or longer ago. The trees are mostly mixed oaks and hickory, with some ash, yellow poplar, and hemlock in the bottoms.

In early April Mr. Tryon will give a short series of illustrated lectures on the forests and forest conditions of South Carolina to the forestry students of Cornell University.

William Maughan, since 1925 an instructor in forest engineering at the New York State College of Forestry, has entered the Yale Forest School to work for the M. F. degree.

L. H. Pennington and H. P. Brown, of the faculty of the New York State College of Forestry, are each entering upon a year of sabbatical leave. Doctor Pennington will be engaged in completing and preparing for publication a thesis on the epidemiology of white-pine blister rust, to be published by the Department of Agriculture; Doctor Brown plans to complete his work on a manual of Indian timbers, prepared in collaboration with R. L. Pearson, director of the forest products laboratory at Princes Risborough, Hants, England. This manual was projected six years ago when Doctor Brown and Doctor Pearson were both stationed at the Indian Forest Research Institute at Dehra Dun, India.

Eugene C. Auchter, professor of horticulture in the University of Maryland and chief horticulturist of the Maryland Experiment Station and the Maryland Extension Service, has been appointed principal horticulturist in the Bureau of Plant Industry. He is in charge of the bureau's newly created office of horticultural crops and diseases.

H. B. Somerset, of Melbourne, Australia, has joined the pulp and paper staff of the Forest Products Laboratory, Madison, Wis., and will work at the laboratory for a year before returning to Australia to take a position in a paper mill operating on Eucalyptus. C. Ellis, forest economist to the forest service of Queensland, Australia, will make his headquarters at the laboratory for the next year or so, studying its organization and methods and using it as a point of departure for trips to wood-using industries of the United States and Canada. J. Wiertelak, assistant in the institute of chemistry, University of Poznan, Poland, has come to the laboratory on a scholarship of the Polish Ministry of Education and will spend a year there in studies principally dealing with the chemistry of wood. Other foreign investigators working at the laboratory include K. Kuoppamaki, mechanical engineer from Finland, who is studying the manufacture of plywood; J. E. Cummins and H. E. Dadswell, of the Commonwealth Council for Scientific and Industrial Research, Australia, who are nearing the end of a 2-year study; and Carl Gustaf Strokirk, Harnosand, Sweden, who is studying plywood manufacture and other wood-utilization problems on a grant from the University of Commerce, Stockholm.

Ira T. Yarnall, supervisor of the White Mountain National Forest, N. H., has been transferred to Washington, D. C., as assistant district forester of the Eastern National Forest District in charge of lands. James E. Scott, formerly in charge of public-relations work in this district, succeeds Mr. Yarnall as forest supervisor.

Bibliography

The Best Forage Species not Always Handicapped by Overgrazing?

By W. A. Dayton, United States Forest Service

The old adage "Tot homines, quot sententiæ" seems to apply even in some matters that have been made the subject of close and careful observation. In our Western States it is held to be almost axiomatic that overgrazing favors inferior forage species at the expense of the most palatable ones; yet in England, it appears, the exactly opposite opinion is held. At least so intimates E. Wyllie Fenton, in a paper entitled "The Influence of Grazing on Vegetation," published in the Transactions and Proceedings of the Torquay Natural History Society (Vol. IV, Part IV, pp. 315–323, 1926). Torquay (tor-kee'), by the way, a place famous for the beauty of its situation and for its peculiar, almost subtropical climate and vegetation, is situated in southwestern England on the English Channel.

Mr. Fenton finds that "animals tend to graze those plants and those areas which are most rich in certain things such as phosphates and lime." He regards cattle as general grazers and "not very selective," horses as "rather selective" and on that account tending to "upset the balance of a pasture." Sheep, he says, "are close grazers and tend to leave the coarser vegetation." He finds that light grazing hurts the more valuable species the most, and that grasslands deteriorate under such use, but that when grazing is intensive, other things being equal, "the useful and more nutritious grasses are favored (being more amenable to grazing), spread, and tend to crush out the inferior types."

In the fields observed by Mr. Fenton the commonest grasses are creeping bent grass (*Agrostis* sp.), sheep fescue, and "Yorkshire fog" (*Holcus lanatus*). Close grazing by rabbits caused noticeable improvement in the stand of white clover. The number of species decreased markedly in a field grazed by cattle, sheep, and horses as compared with a similar field grazed by cattle and horses only. In the first field the native weed types survived only in isolated patches such as would disappear entirely if the pasture were manured.

Mr. Fenton states that where grazing has been made more intense by the admission of a larger number of stock "grasses of coarse tall growth have * * * been replaced by a denser and much more nourishing herbage," and "in pastures which are not 'natural' the success or failure depends very largely on the grazing factor." With decreasing acidity, also, sheep fescue, cinquefoils (*Potentilla* spp.), and Aira cæspitosa decrease in frequency.

Red-Fir Tables for California

By LESTER H. REINEKE, United States Forest Service

Yield, Stand, and Volume Tables for Red Fir in California, by Francis X. Schumacher, recently appeared as Bulletin 456 of the University of California. These tables for red fir (*Abies magnifica*) apply to even-aged second-growth stands that are normal, or fully stocked. They are presented in standard form, using site index (height of dominant trees at 50 years) as the basis for site classification. Site indices range from 15 to 65 feet.

A valuable part of this bulletin is the presentation of stand tables showing the distribution of tree sizes within stands of various ages and site indices. The detailed statistical analysis from which these tables resulted is evidence of the care with which the work was done.

This bulletin should be of particular value, since little has been published heretofore concerning this species.

Forestry Survey of Great Britain

The British Forestry Commission has recently reported on the most complete census yet made of British woodlands. Data were taken for the year 1924. Six-inch ordnance survey maps, on which the acreage and ownership of individual woodlands had been marked, were distributed through voluntary county organizers to woodland owners, who were asked to indicate on the maps the types and age classes of their woods. In Scotland the information was recorded partly by the commission's local correspondents and partly by the technical staff.

The total woodland area of Great Britain was returned at 2,958,672 acres.[2] It was indicated that woodlands occupy 5.1 per cent of the total land area in England, 5 per cent in Wales, and 5.6 per cent in Scotland. The most heavily wooded counties in England, according to these returns, are Sussex, with 14 per cent of its area in woodland; Surrey, with 12.3 per cent; Kent, with 11.1 per cent; and Hampshire, with 11.6 per cent. In Wales, Monmouth has 12.8 per cent of its area wooded, and in Scotland Nairn has 17 per cent, Elgin 16.3 per cent, Kincardine 12.6 per cent, and Aberdeen 10.1 per cent.

High forest constitutes about half the woodland in each of the three parts of the island, totaling 1,416,890 acres. Coppice and coppice with standards total 528,680 acres; scrub, 330,703 acres; felled or devastated, 478,106 acres; and woods not available for the commercial production of timber, 204,293 acres.

Broad-leaved species predominate in England, conifers in Scotland. The composition of the high forests, in round thousands of acres, is as follows:

	England		Wales		Scotland		Great Britain	
	1,000 acres	Per cent	1,000 acres	Per cent	1,000 acres	Per cent	1,000 acres	Per cent
Conifers	195	25.9	47	41.5	430	78.1	672	47.4
Hardwoods	338	44.9	44	38.9	61	11.1	443	31.3
Mixed	220	29.2	22	19.6	59	10.8	302	21.3

In concluding the report the forestry commission says:

The economic or potentially productive woodlands are estimated to contain in all about 2,262 million cubic feet of timber and pit wood.

The area cut over during and immediately after the war is estimated at rather less than 450,000 acres and the volume of timber felled at approximately 1,000 million cubic feet. This is equivalent to roughly one-third of the total volume standing in 1914.

At the present time and in consequence of the war fellings, reserves of mature coniferous timber are very low and equivalent to not more than six months' consumption. The younger crops are on the same scale but are well distributed through the various age classes. The reserves of mature hardwoods (mainly oak), which were not drawn on to the same extent during the war, are considerable, although the average quality is not good. There is a great lack of young hardwood plantations. Oak planting in particular has gone out of fashion in favor of conifers. When the existing mature and semimature oak woods have disappeared, as they are steadily doing, the supply of home-grown oak will become negligible.

There was distinct evidence in the woodland censuses of 1905 and 1913–14 that the total area of woodland was steadily diminishing. The average rate of planting from 1884 onwards had been about 12,000 acres per annum, which was roughly about 50 per cent of the rate required to maintain the nominal woodland area in a good state of productivity. The unprecedented war fellings swept away the bulk of the best coniferous timber, the best ash, and much good oak.

As regards the future, it is certain that fellings will go on steadily to provide revenue and that private planting at best will do no more than replace current fellings. Further, landowners are less and less inclined to plant hardwood trees, such as oak, which are unremunerative to grow. At the same time a gradual degeneration may be looked for in the stocking of coppice-with-standards and coppice woods. It is unlikely, therefore, that the area of effectively productive woodland in private ownership will in the future exceed 1½ million acres, if indeed it reaches that figure. Any acreage over this figure which is deemed necessary for the welfare of the country will have to be planted by the State.

Together with this report the forestry commission has published its report on a census of the timber produced (felled) in Great Britain in the year ending September 30, 1924. This census, undertaken at the request of the Board of Trade as part of the general census of production for Great Britain for the year 1924, was carried out on a sample basis. Selected landowners were asked to make returns of the volume of timber and other wood felled on their property during the year, classifying it by types of woodland and

[2] The fact that this figure is 222,484 acres larger than that returned in 1913–14 is explained by different and more intensive methods of survey in the 1924 census, especially by the inclusion of "scrub."

by classes of material. Data were collected in this way for about 11.3 per cent of the total woodland area of Great Britain, and on this basis calculations were made for the whole country. Figures thus evolved for the total volume of timber and other wood felled in Great Britain during the year of the census are as follows:

	England		Wales		Scotland		Great Britain	
	1,000,000 cubic feet	Cubic feet per acre	1,000,000 cubic feet	Cubic feet per acre	1,000,000 cubic feet	Cubic feet per acre	1,000,000 cubic feet	Cubic feet per acre
High forest:								
Conifers	5.14	26.3	0.76	16.3	18.59	43.3	24.50	36.5
Hardwoods	10.01	29.6	1.66	37.7	1.09	17.8	12.76	28.8
Mixed	4.15	18.8	.85	38.4	1.06	18.0	6.06	20.1
Coppice and coppice with standards	8.11	16.7	.38	10.6	.07	8.2	8.55	16.2
Hedgerow timber	1.56	------	.12	------	.03	------	1.71	------
Other	1.09	2.8	.03	.3	1.29	2.5	2.41	2.4
Total	30.06	18.4	3.80	15.0	22.13	20.6	55.99	18.9

The census of timber production covered the value of timber sold. Timber of sawmill size appears to have been sold at the average prices of 13d. per cubic foot for larch, 7d. for spruce, 6d. for Scotch pine, and 5d. for other conifers. The highest average price, according to the calculations, was 22d. paid for ash. Oak brought 18d., elm 10½d., beech 10d., and other hardwoods 10d.

The total number of persons permanently employed in British forests during the year ending September 30, 1924, is calculated to have been 19,220. The number of persons temporarily employed in the forests ranged during the year from 4,090 to 10,000.

(Forestry Commission, Great Britain: Report on Census of Woodlands and Census of Production of Home-Grown Timber, 1924. 68 pp. maps. His Majesty's Stationery Office, London, 1928.)

Growing Pine Pulpwood as a Farm Crop

The extension forester of Arkansas, W. K. Williams, has issued an extremely practical and helpful pamphlet entitled "Growing Pine Pulpwood as a Farm Crop." It contains information not only about farm-woods management but about methods of estimating and selling the crop, the growth to be expected from loblolly pine and stumpage prices, and shipping weights of pulpwood. The pamphlet also discusses the farm-woodland situation in southern Arkansas and includes a form for timber sale contracts. Most of its pages are filled with usable information, the kind that is of immediate value in actual practice.

Fiber Measurement in Norway Spruce

A report by Dr. Elias Mork of the Norwegian Forest Experiment Station on his experiments in measuring fibers of Norway spruce (Granvirkets kvalitet sacrlig med sigte paa slip-og celluloseved, Papir-Journalen Nos. 4–10, 1928) has been abstracted by Henry I. Baldwin as follows:

Mork defines summer wood as that part of the annual ring in which the cell wall between two lumina, multiplied by 2, is equal to or greater than the lumen, and spring wood as the section in which this quantity is less than the lumen. The proportion of summer wood varies according to the width of the annual ring. It is greatest in narrow rings, in which it ranges up to 55 per cent. In medium broad rings it ranges between 10 and 25 per cent. Rings 7 millimeters wide have but half as much summer wood as rings 1.3 millimeters wide, and fibers 20 per cent shorter. Fibers in the summer wood have thicker walls and smaller lumina, and are stronger, denser, and longer than fibers in the spring wood. Narrow rings, also, contain less parenchyma and fewer resin ducts than wide rings.

The length of the fibers varies not only with the width of the annual rings but with the distance from the pith. Fibers are short near the pith (in Picea excelsa, 1 to 1.5 millimeters), increasing in length toward the bark, where they are often twice as long. A more rapid increase of fiber length from pith to bark is found the farther up the tree one goes. The longest fibers are found about 5 meters above the ground. Fibers in the root swelling are short.

Butt logs, having a smaller proportion of summer wood, shorter fibers, and lower density of fibers, are less valuable for pulp manufacture than wood from the center of the bole. Logs of small diameter, also, are less valuable, because they contain a greater proportion of pith.

Trees from good sites under otherwise equal conditions have longer fibers and a greater percentage of summer wood than trees from average sites.

Recent Books and Pamphlets

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Ahern, G. P.: Deforested America. 79 pp. The author, Washington, D. C., 1928.

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Steffen, E. H., and Genaux, C. M.: Trees for Washington farms: why, where, what, when, and how to plant. 47 pp. illus., map. Pullman, Wash., 1928. (Washington Agricultural Experiment Station popular bulletin no. 143.)

Stephen, J. W.: Making best use of idle lands in New York. 55 pp. illus. (New York State College of Forestry bulletin no. 17.) Syracuse, N. Y., 1928.

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Recent Publications of the Forest Service

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Miscellaneous publications: Measuring Forest Fire Danger in Northern Idaho; The Report of the Forester for the fiscal year ending June 30, 1928; Forest Service Directory; Vacation in the National Forests; Winter Sports on Mount Hood.

National Forest Administrative Maps: ¼-inch, Klamath, Teton; ½-inch, San Juan, Ozark.

The New York Conservation Department recently issued a booklet entitled "Catskill Trails," by W. D. Mulholland, giving complete logs, with walking time, of the forest trails in the Catskills. An outline map in colors is included.

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