

- (2.) That required by forest rangers, forest guards, woods foremen, &c., tree-planting experts, nursery foremen, &c.
- (3.) Special instruction for private owners and operators of woodlands, timbermen, and others who desire work in special lines or can use only a superficial knowledge of technical forestry.

The following courses of instruction should be provided :—

- (1.) A four-year course designed to train students for the practice of professional forestry in its broader phases.
- (2.) A short course of one year designed for men employed as forest rangers, guards in the Forest Service, or for men in the employ of forest-exploitation companies who desire such training as will enable them to carry on their work more efficiently.
- (3.) A four-year course designed to train men for work as logging and milling engineers with sawmilling concerns, with consulting engineers, in the Forest Service, &c.
- (4.) Special courses could also be given in such subjects as—Pulp and paper making; dry-kiln engineering and plywood manufacture; timber-grading; management of farmers' woodlots, scenic reserves, parks, &c.; timber-appraisal; forest utilization (general); forestry for civil engineers; short course in forestry for agricultural instructors and others who might desire to prepare themselves to give instruction before technical schools, high schools, &c.; distribution and marketing of forest products; wood distillation and extraction; history and economic aspects of forestry; forest nursery practice and tree-planting; kauri-gum recovery, extraction.

The forest school, in addition, should be prepared to give instruction and advice by means of lectures, exhibitions, and demonstrations throughout the Dominion; to issue publications, bulletins, and circulars, and to give expert advice to private owners who may desire to practise forestry or engage in milling; to generally assume the position as leader of progressive academic thought along forestry lines.

#### FOREST INVESTIGATION AND RESEARCH.

The formation of a strong research division is absolutely necessary if we are to make any advance in the solution of the forest problems of New Zealand. *This cannot be urged too strongly.* One has only to review past achievements of forestry in New Zealand to see that the one great vital thing lacking has been systematic observation and study. During the past twenty-five years £300,000 has been spent—earnestly and sincerely, it is true—but the sum total of all that expenditure is 35,000 acres of planted forest. No investigations have been made as to the fundamental requirements of forestry as applied to the great indigenous forests. To-day *we must start from zero* and gradually build up a knowledge upon which our programme may be based. In forestry we are dealing with nature and time, therefore the study of nature's *modus operandi* must be begun at once, so that by the time the State forests are demarcated it will be definitely possible to prescribe the finer details necessary for their management.

In scope the investigations should cover activities such as silviculture, including reforestation; tree and shrub distribution; volume and yield measurement; forest influences; protection from fire, insects, and disease; exploitation methods and costs; stumpage appraisals; dendrology; grazing; kauri-gum resources, &c. In general, those studies of particular problems should be undertaken which are of practical value to the Forest Service, to sawmillers, and users of forest products.

The work of investigation falls actually under two heads—namely, “Silvicultural Investigations” and “Investigations in Forest Products.” The machinery necessary to successfully undertake the various problems includes a Forest Experimental Station and a Forest Products Laboratory. As far as possible the investigative work of a technical and experimental character should be conducted at the Forest Experiment Station or the Forest Products Laboratory.

#### Forest Experiment Station.

The purpose of the Forest Experiment Station is to establish fundamental principles or laws which may be generally applied, and not merely to study local products. The formulation of permanent plans of management of the State forests will be naturally hastened by accurate forest descriptions (silvical) of all forest types and characteristics of species composing them. Without this basic data as to the formation of forest types, their performance when disturbed, and the succession leading up to the old climax type, little can be done. The following ground should be covered:—

- (1.) The forest: (a) Complete list of trees; (b) complete list of shrubs; (c) the permanent types and the factors which differentiate them—climate, soil, altitude, and topography; (d) a silvical description of each type, to include proportion, soil, climate, and site, forestal characteristics, composition, interrelation of various species, even or uneven—aged stands, &c.; external influences operative in the type—fires, grazing, storms, &c.; recommendations for silvicultural management; results of former cuttings, how they can be improved; the presence of temporary types; cause, and life-cycle of each.
- (2.) The individual species: (a) Habit, diameter, height, crown, bole, root-system; (b) occurrence, distribution, effect of altitude, soil, &c.; (c) soil-moisture requirements; (d) tolerance of shade; (e) growth and longevity; (f) reproduction.
- (3.) Study of cut-over areas.
- (4.) Forest-distribution.
- (5.) Insect infestation.
- (6.) Tree-diseases.