Summary

With completion of assessment survey of lowland indigenous commercial forests, surveys of highland watershed protection forests are to be undertaken. The field of work, objectives, and proposed survey and research programmes are briefly outlined. In short, a triple attack on outstanding problems is proposed. Firstly, detailed reconnaissance surveys to define the problems; secondly, establishment of permanent reference points by periodic re-assessment of which all trends in the condition of forested watersheds may be judged; and thirdly, fundamental research along lines dictated by the results of surveys.

Introduction

The first major task of the National Forest Survey nears completion. The native forests of New Zealand have been combed for timber stands of commercial value. Two million acres of commercial quality forest have been mapped and the timber content of these forests is now, for the first time, known to within reasonably narrow limits. The moment would therefore seem opportune to say something of the intentions of Forest Survey with respect to the fourteen million acres of forest classified as non-commercial—the watershed protection forests of New Zealand.

Not that all native forests of commercial quality are without value in the field of watershed protection: many of them are of importance in this field and must be regarded as multiple use forests. Nor are all forests, barren of merchantable timber, essential protection forests. This is a common popular error. But, by and large, the non-commercial forests of New Zealand, together with the scrublands and grasslands that lie above the forests, constitute the hard core of the national defence system against flood. On their well-being we are dependent for sustained yield of useful water in controlled flow. Their importance is not less than that of the commercial forests. Study of them is the second major task of Forest Survey.

Some work has already been done. In the determination of merchantability limits and in the search for pockets of merchantable timber, we have been forced to explore very great areas of non-commercial forest. Nearly two million acres of such forest have been mapped in conjunction with the mapping of the two million acres of commercial forest already mentioned. Wherever time has permitted, survey lines have been run right through to the uppermost limits of tree growth on the mountains. Forest Survey field parties, over the
past ten years, have been through to the timberlines, at one or many points, on all the mountain ranges in New Zealand.

It can, in fact, be said that all reconnaissance work pre-requisite to the planning of detailed survey is already accomplished. The outline that follows is briefly indicative of the situation revealed by these reconnaissances and of our proposed plan of action.

Generalities

It is almost impossible to speak of watersheds and of watershed protection forests without tedious repetition of the word “problem.” Problems in protection forest management of some sort and in some degree, arise wherever there are forests on hills or mountains rising above settled lowlands; or where some use, actual or intended, is made of the water resource. There is no problem only where the lowlands are valueless and the water resource is completely neglected. But immediately man enters the scene problems are created since floods and erosion are normal to all highlands and inevitably affect all adjacent lowlands. This is true even where the watersheds remain in virgin condition, untouched by man. There is always the possibility of trouble, a possibility that becomes a probability the moment man interferes with the vegetation of the mountains.

This is the situation in which we find ourselves. We have settled the lowlands, we are using the water resources of the highlands, and we have interfered with the vegetation of the mountains. Fire has swept through the mountain forests time and again. Fire has been employed as a regular tool in “management” of the mountain grasslands. A veritable host of exotic animals have been let loose and have thriven exceedingly well in forests and on grasslands that never before had known the tread of mammals. On every hand all semblance of natural balance in the native vegetation has been thoroughly upset. The price must be paid. Payment cannot be avoided. To the validity of this statement cursory study of the history of any mountainous land will bear witness.

“In former days both mountains and forests were full of trees and vast forests and the rains, falling upon these forests, were soon dispersed. The water was almost wholly absorbed by the dead leaves and by the ground itself. Likewise the winter snows, lying in the shadow of the forests, melted away gradually, the melt waters losing themselves in the soil. Little of the water from rains or snow found its way directly from the mountains to the rivers. Therefore these were not subject to floods but flowed leisurely in their courses doing no damage of any consequence. The little silt and debris they carried was nearly all re-deposited in the forest and scrub that stood upon the river banks. But now that the vegetation has been stripped from the mountains of this Dominion, there is nothing to absorb the rain, nothing to retard the melting of the winter snows, and the rain waters and the melt waters rush directly into
the rivers. Laden with great quantities of sediment, these break their banks, lay waste the lowlands, destroy bridges and even towns as we in our time have often seen, in their turbulent rush to the sea. The soil, rich and poor, is swept into the ocean.

"It appears that the fires, that during this century have so many times been set in the mountains, are indeed the real and main cause of these evils. Some people set fire to the forest in order to convert it into fields and pasture. Others set alight the scrub and grass to enlarge the area of grazing land and to obtain a quicker and more tender crop of young grass. The evils of flood will not be removed until once more the rivers are brought under control by repair of the banks and by restoration, through fire control, of the forests to the high mountains."

By whom was that written? By some French forester towards the close of the 18th Century? By an American soil conservator in the 20th Century? By a New Zealander thoroughly familiar with our east coast rivers? It is abstracted from a report submitted to the Government of Venice in the year 1608, a report dealing with siltation in the Venetian lagoons. So history repeats itself; from the Indus Valley and Mesopotamia to Greece and Italy; from France and Spain to New Zealand and Patagonia; in all lands the same story.

Not quite the same story; in some lands no repair of the situation has been attempted until too late; in others, through costly engineering works and laborious repair of the mountain forests and grasslands, control has been regained. In New Zealand, though an immense amount of damage has been done in a very short space of time, we have not yet plumbed the depths. There is immense variation in degree of damage from forest to forest, from watershed to watershed. Locally the situation is serious, possibly irreparable at reasonable cost. Locally again, the forest and grasslands, though strongly modified, remain healthy, providing an adequate soil cover. But generally the watersheds are in a betwixt and between condition. The forests and grasslands are profoundly modified, no longer protect the soil adequately, no longer retard run-off to the extent that they should, but are not damaged to the point that repair does not seem feasible.

What are needed, therefore, are accurate diagnoses and prognoses, interpretations of the current situations and forecasts of probable future developments. This diagnostic and prognostic work is the task on hand.

Priorities

Where do we start? The job to be done is a big one. In comparison, manpower resources are slight. There are fourteen million acres of non-commercial forest with, possibly, an equal area of high alpine

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land above the forests. The first essential is the erection of some system of priorities.

As already noted, protection forest problems, in some degree, arise wherever there are forests on hill or mountain country above occupied lowlands. But the suggestion is made that, in New Zealand, there are few serious technical problems to be faced where climates are true forest climates and the height of land does not exceed 3,000 feet above sea-level. At altitudes below 3,000 feet, rather more in the north and less in the south, the native vegetation, granted control of fire, closure of the lands to domestic stock, and some degree of control over wild animal populations, is sufficiently aggressive to recover and reclothe the land even after a prolonged period of land abuse. Or, failing recovery of the native vegetation, we have a sufficient number of proven exotic species to do the job required.

To cite one example: the hill country to the north of Gisborne is sick country with a rash of erosional sore spots; but, regarded strictly from a forest viewpoint, the cure is simple. With control of fire, cessation of grazing, and vigilance against wild animals, would not these lands revert to a jungle growth of pre-forest scrub in a very short order? It cannot be pretended that this would be the most desirable outcome. A complete reversion of these lands to forest would not be in the best national interest. But to the extent that the return is made, local problems may readily be solved. To the extent that it is not made, the problems to be faced are not problems for foresters to deal with.

Other examples could be given. There is no hill country within areas of forest climate where the situation, technically speaking, is not equally straightforward. No matter how difficult local problems, regarded as grassland problems, may be, the forest answer is a simple one. Serious difficulty will be met only in those few special cases where climates are marginal forest climates. These special cases may, for the moment, be neglected. They are of no great consequence save, locally, in eastern and inland regions of the South Island. The real problems, those of greatest magnitude likely to be encountered by foresters, are those to be found where the height of land exceeds 3,000 feet.

These highlands are the critical lands where most of the rain falls. They are the lands where normal erosion is most active with a precarious state of balance obtaining between bare rock and moving scree, on the one hand, and vegetation on the other. They are the lands most heavily infested by introduced wild animals. They are the lands where a measure of control over wild animals is most difficult to achieve. In large part they are trackless, roadless, difficult to traverse on foot, difficult and dangerous to work in. In these mountains we find the most erosion subject soils in New Zealand. Frost action is intense. Gale force winds blow frequently. Growing seasons are short and cold. For these lands we have no tried and
tested exotic plant species for use where indigenous species fail, as they are failing, under pressure from introduced animals. On all counts it is here that trouble must be expected. In this land category, with the inclusion of the very steep land on the lower slopes of these mountains, we have approximately one sixth of the total land area of the North Island, and over one third of the total land area of the South Island. To those with even the slightest knowledge of these highlands, the sheer physical magnitude of the task ahead will be apparent.

Fortunately, however, not all highland watersheds are of equal importance, not all of them have been damaged, or are threatened with damage, to an equal extent. In some cases the mountain derived rivers menace no lowland interests and the watershed forests cannot be called "protection" forests since this term can only be used, legitimately, where something of value is protected. The forests of Fiordland fall into this class. Fiordland forests, themselves, may be worth protecting for aesthetic or scientific reasons but they are not protection forests. Again, in other regions and on other watersheds, the forests are currently in satisfactory order. There is no call for immediate action other than sustained vigilance against possible agents of damage. Many of the high mountain forests in the northwest of the South Island, e.g., the forests of the Paparoa Range, are in this condition. Elsewhere, climates are not true forest climates and the responsibilities of watershed management fall to the lot of grassland specialists, not to the lot of foresters. Many of the high alpine watersheds bounding the semi-arid intermonts of Central Otago, South Canterbury, and inland Marlborough might be listed here. And so the field of work can be narrowed.

All points of view considered, it is thought obvious that most urgent attention must be paid to the forests of the greywacke ranges that form the backbone of both North and South Islands, in particular to the forests that lie on the drier eastern slopes of these ranges. This is where reconnaissances reveal the greatest degree of damage. It is on the eastern slopes of these mountains that the forests and other high altitude types of vegetation have failed most radically under grazing and browsing pressure, displaying, particularly in the south, the least recuperative capacity. And the rivers rising along these eastern mountain slopes all traverse densely populated lowlands. First attention must clearly be paid to those forests that lie about the headwaters of eastward flowing rivers posing the greatest threat to major lowland communities. Two prime examples spring to mind: the Waimakariri River in the south, and the Ngaruroro and Tutaekuri Rivers in the north, rivers that directly threaten the city of Christchurch and the twin cities of Hastings and Napier; to the forests about the headwaters of these rivers priority must be given.
Programmes

The field of operations has now been outlined and a broad system of priorities suggested. What programme of work is planned for each particular watershed or forest? A three-pronged attack on watershed protection forest problems will be made.

Firstly, the work of diagnosis; reconnaissance surveys, more thorough than those already completed, will be made by small teams of specialist officers working, where necessary and wherever this can be arranged, in close field liaison with specialist field officers of other watershed interests and authorities. Ultimately two teams should be engaged on this work, one each for the North and South Islands, four to five officers covering an appropriate range of scientific disciplines to a team. Reconnaissance reports should provide sufficient reliable information for the confident preparation, by Forest Conservancies, of five to ten year management plans.

Secondly, since we are required to deal with situations constantly subject to change, the work of prognosis: concurrently with survey, a network of permanent reference points, line transects, charted quadrats, permanent camera stations, etc., will be set up in each forest and watershed. These, recharted and rephotographed at five to ten year intervals, will provide information on the direction and extent of change, information necessary for the revision and correction of management plans.

And thirdly, since it would patently be absurd to confine all attention to the discovery of problems without attempting study of fundamental causes and possible solutions, related research projects will be actively pursued during those seasons of the year when extensive survey operations in the high alps are impracticable. Each officer engaged will be responsible for work in one defined field, e.g., species establishment and acclimatisation trials, use of indigenous species in counter-erosion work, infiltration and run-off studies, etc., etc.

In other words and in simpler language, no road will be left unexplored in the search for answers to the following questions:

Where and to what extent have things gone wrong? Where can trouble be expected? What should be, can be, or had best be done? What means should be employed to prevent things going wrong in future?

There remains but to set some limit to the field of responsibility, to define the operational boundaries. Obviously we will be concerned with all forests within the category of protection forests and with other classes of high mountain vegetation where these fall within the boundaries of reserved forest land. Perhaps less obviously, we must concern ourselves with all lands above the forests. Problems in protection forest management are, in the last analysis, susceptible of solution only where a start is made at the top and all work proceeds from above downwards. No amount of effort, expended wholly at low or mid altitudes, will be of lasting benefit if the highlands continue
neglected. The well-being of the lowlands is dependent on the well-being of the mountain forests, and this in turn is dependent on the safe-keeping of the scrublands and grasslands that lie at higher altitudes still. In default of any other agency or authority accepting responsibility for the lands above the forests, foresters must work from the lowland forest limits right through to the snowline—this being particularly the case now that the national forest authority is at one and the same time the authority responsible for control of noxious wild animals wherever they may be found—in the forests in winter, above the forests in summer.

The inclusion of the above-forest lands within the field of survey operations is thus doubly necessary. All work will proceed from the top downwards, from the snowline to the point where we meet pastoral lands specialists working upwards from the valley bottoms, or until we enter outright commercial forest. No hard and fast lowland limits can be set. These must vary from time to time with discoveries yet to be made in the fields both of forest and of pastoral land management. On only one point in this connection is it possible to be dogmatic; there is no room here for professional parochialism, for division of the work to be done into watertight compartments; the great need is for joint effort and mutual understanding directed toward a common end, the well-being of the watersheds.