

shrubs as rangiora, and planting the edge of the lake itself with nigger heads, toetoe, and flax, all as graceful in form as the much-admired Papyrus of Egypt.

V.D. Zotov.

LIFE FORMS OF PLANTS.

In order to learn the names of plants and to study the relationships we must know the shapes of the leaves and the structure of the flowers. But if we investigate the relation between plants and their surroundings, that is, the form of plants in different situations and the changes in their growth through the seasons we must use other characters. The chief of these are the following:-

1. General form.

Between the tall forest tree with its massive upright trunk and widely spreading head of foliage, and the lowly cushion plant of mountain bogs there are numerous forms each apparently nicely suited to the station in which it lives.

2. Seasonal changes.

These refer to the time of flowering and fruiting, to the leaf fall and growth of new leaves in spring, to the dying down to the ground of the whole plant in winter, and to the length of life of the species, that is, whether it lives for one, two, few, or many years.

3. Protective tissue.

The outer surface of a plant, besides performing such functions as controlling the inlet and outlet of air and water, must serve the purpose of protecting the plant against the weather and the attacks of insects, fungi, predacious animals and other dangers. For all these functions the outermost walls of the surface layer of cells are thickened in various ways and are usually furnished with a cuticle impervious to water.

4. Resistance to salinity and acidity.

Certain species have special powers of living under salty or acid conditions. Plants that grow in saline situations are usually succulent in leaf and stem.

5. Adjustment to changed conditions.

An alteration in the environment may be overcome by some plants in various ways. Shade, sun, excessive wind, and salt alter the growth.

6. Pollination.

The methods that plants have for transferring pollen from flower to flower may have definite relations with the

environment, the pollen itself being sticky for insect transport, or dry where wind is the effective agent.

7. Seed dispersal.

The ability of a plant species to occupy new ground or to maintain itself in its own station depends on its seeds being carried from the parent plant to places suitable for germination and establishment. The seeds or fruit containing them are adapted in various ways for transport by wind, water or animals.

The definition of life forms is however only the beginning of the study of ecology. Plants are not scattered about haphazard but are grouped in association with animals, into more or less definable communities. But it is the plants which give the outstanding characteristics to the associations. It is the plant covering that gives character to the landscape.

In what follows the term "association" is used when referring to a community characterized by its principal species, while the term "formation" is used when the community is considered from the point of view of the principal life forms. Thus we may speak of a forest, scrub, or swamp formation, and of a kauri, manuka, or raupo association.

The plant formations of New Zealand may conveniently be grouped under two main series, namely herbaceous and woody formations.

Herbaceous Series. Submerged herbs like the seawrack

(Zostera) and Ruppia. Swamp formations of tufted plants, e.g. raupo, Leptocarpus, Carex. Formations of mat plants in damp places, alpine formations of smaller herbs mostly dying down in winter.

Formations of low succulent plants near the shore, e.g.

Salicornia, Lesembryanthemum, Chenopodium.

Sand-binding plants like Spinifex, pingao (Desmoschoenus) and marram.

Tussock formations dominated principally by Festuca novae-zelandiae, Poa caespitosa, and Danthonia racoulii.

Woody Series. Cushion plants. The leafy tips of the branches form the cushion surface but within is often a woody stem, and a well-developed tap root. These are found especially in bogs, along the sea coast, on river beds, and on wind-swept mountain areas. Small-leaved shrub formations formed by manuka, Pomaderris phyllicifolia, Discaria, various species of Dracophyllum, and Coprosma. The bracken fern association might properly be included here.

Scrubs composed of broad-leaved plants, found mainly

as a belt along the coast and above the tree line on the mountains. Taupata is especially distinctive of some coastal associations in the North Island, while in the far south similar associations are formed by the puheretaiko (Senecio rotundifolius) and several species of serrated-leaved Olearias (O. angustifolia, O. colensoi, O. oerina).

Forests show the highest development of communal vegetation. In a rain forest are life forms of several types, some protected by, some supported by the trees themselves. As one life form depends for its habitat on the presence of other life forms the forest may be likened to an organized being.

Principal types of forest in New Zealand.

Kauri forest, found only in the northern part of the North Island usually in patches alternating with a broad-leaved forest dominated by taraire.

Podocarp. forests e.g. kahikatea on wet ground, rimu where rainfall is ample, totara under drier conditions, silver pine in boggy or swampy ground.

Beech forests e.g. mountain beech on the eastern slopes of the Southern Alps, extending out to the limit of the western rainfall, and at the upper limit of forest on the central mountains of North Island; black beech, especially characteristic of the beech forests of Wellington province; silver beech in rainy or foggy climates, for instance in the West Coast Sounds district of Otago, and as a belt along the tree line in the Tararua mountains, a notoriously wet locality.

Broad-leaved dicotyledonous forests. Mangrove is the only tree in an inter-tidal rain-forest. Pohutukawa, kareka, ngaio, karo, and puriri are characteristic of North Island maritime forests. Taraire is conspicuous in forests north of Auckland. Further south its congener, the tawa, is dominant over wide areas. The ratas, Metrosideros robusta and M. umbellata are essential elements in the forests of North and South Islands respectively, while kamahi is abundant throughout.

On river terraces, mountains, and the eastern districts of both islands are forests of smaller kinds of trees: mahoe, kowhai, lacebarks, ti, kaikomako, lancewood, and many others.

W.R.B. Oliver, Presidential address, 27/8/42).