

1911.
NEW ZEALAND.

DEPARTMENT OF LANDS:
REPORT ON THE DUNE-AREAS OF NEW ZEALAND,
THEIR GEOLOGY, BOTANY, AND RECLAMATION.

By L. COCKAYNE, Ph.D., F.L.S.

Presented to both Houses of the General Assembly by Command of His Excellency.

INDEX TO CONTENTS.

INTRODUCTION.	Page	PART I.—THE GEOLOGY AND BOTANY OF THE DUNES—continued.	Page
(a.) General remarks	3	I. <i>Geology</i> —continued.	
(b.) Objects of dune-culture	4	(i.) Inland dunes	18
(c.) Previous investigations of New Zealand dunes	5	(i.) The volcanic plateau	18
(d.) The dune-areas of New Zealand	5	(ii.) The Canterbury Plain	18
		(iii.) Central Otago	18
PART I.—THE GEOLOGY AND BOTANY OF THE DUNES.		II. <i>Botany</i> .	
I. <i>Geology</i> .		(A.) Ecological botany	19
(a.) General	7	(a.) General remarks	19
(b.) The material of dunes, and its origin	7	(b.) Conditions for plant-life	19
(i.) Origin of dune-sand	7	(i.) General	19
(ii.) Material of dunes	8	(ii.) Climatic factors	19
(iii.) Form of the sand-grains	8	(a.) Wind	19
(c.) Dune-building on the coast	9	(β.) Heat (partly considered in	
(i.) General	9	relation with the soil)	20
(ii.) Movement of sand by the wind	9	(γ.) Light	21
(iii.) Sand-ripples	9	(δ.) Moisture	21
(iv.) Plants as dune-builders	10	(iii.) The soil factor	21
(v.) Effect of obstacles	10	(iv.) The topographical factor	22
(a.) General	10	(v.) The plant-covering factor	22
(β.) Solid obstacles	10	(vi.) The animal factor	22
(γ.) Flexible open obstacles	11	(vii.) Fire	22
(δ.) Inflexible open obstacles	11	(c.) The most characteristic plants, their	
(vi.) Stratification of dunes	11	growth-forms, and adaptations	22
(vii.) Effect of climate	11	(i.) General	22
(d.) The foredune	11	(ii.) The leading dune-plants	23
(e.) General topography of a dune-area in New Zealand	12	(a.) Sand-binders	23
(f.) Movements of dunes and dune-sand	12	(a.) Major	23
(i.) General	12	(b.) Minor	23
(ii.) Wind as a destructive agent	13	(β.) Sand-collectors	23
(iii.) Dune-wandering	14	(a.) Major	23
(iv.) Sand-drifting	14	(b.) Minor	23
(g.) Land-forms of the dune-area	15	(γ.) Wet-ground plants	23
(i.) Dunes	15	(iii.) Descriptions of plants	23
(a.) Dune-ridges	15	(a.) <i>Spartifex hirsutus</i>	24
(β.) Isolated hills	15	(β.) <i>Scirpus frondosus</i>	24
(γ.) Mounds	15	(γ.) <i>Euphorbia glauca</i>	24
(δ.) Wandering dunes	15	(δ.) <i>Calystegia Soldanella</i>	24
(ε.) Cliff-dunes	16	(ε.) <i>Carex pumila</i>	24
(a.) The under cliff-dune	16	(ζ.) <i>Arundo conspicua</i>	25
(b.) The upper cliff-dune	16	(η.) <i>Coprosma acerosa</i>	25
(ii.) Sandspits	16	(ι.) <i>Pimelea arenaria</i>	25
(iii.) Sand-plains	16	(κ.) The dune species of <i>Cassinia</i>	25
(iv.) Quicksands	17	(λ.) <i>Festuca littoralis</i>	26
(v.) Swamps	17	(μ.) <i>Calamagrostis Billardieri</i>	26
(vi.) Lakes and ponds	17	(ν.) <i>Scirpus nodosus</i>	26
(h.) The virgin dunes	17	(o.) <i>Leptocarpus simplex</i>	26
(i.) Effect of man, &c., on the dunes	17	(π.) <i>Gunnera arenaria</i>	26
		(d.) Methods of spreading of dune-plants	26