



Fig. 85 **Mossfield.** Lammermoor Range, Otago; rolling land in the montane zone with snow tussock grassland. Peat accumulation in gully heads can vary in character between bog and fen: the red-brown patch in this small wetland is *Sphagnum cristatum* moss fen; palustrine.



Fig. 86 **Mossfield.** Tuku, Chatham Island; a very poorly drained hill crest on the blanket peat of the southern table-land, with low *Dracophyllum arboreum* forest beyond, and in foreground: *Sphagnum falcatulum* moss bog; palustrine.



Fig. 87 **Mossfield.** Hollyford Valley, Fiordland; a temporary stream channel with a silty base on a forested valley floor; ponded during and after rain storms, and sufficiently wet at other times to exclude woody plants but encourage tussocks of *Carex virgata* among *Hypnodendron marginatum* moss ephemeral wetland; palustrine.



Fig. 88 **Lichenfield.** Lammerlaw Range, Otago; an upland mire where upward growth of herb and moss cushions has raised their surface sufficiently above the water table for lichen dominance to be favoured by the frequent alternation of drying and wetting by rain and mist: *Alectoria - Cetraria* lichen bog; palustrine.



Fig. 89 Algalfield. Middlemarch, Otago; a stream in open grassy country at a time when low summer flow and warm temperature encourage rampant growth of filamentous green algae: algalfield, shallow water; riverine.

2.9.2 Examples of aquatic plant growth habit

The following illustrations show how the growth habit of aquatic plants, and where they grow in relation to water surface level and substrate, can be used as additional descriptors for shallow-water habitats.



Fig. 90 Emergent aquatic. Hamilton Lake, Waikato; the shallow margins of a small lake of relatively stable water level where bottom-rooted plants are emergent, holding their foliage above water level. Emergent lake clubrush (*Schoenoplectus validus*) - yellow flag (*Iris pseudacorus*) reedland, shallow water; lacustrine.



Fig. 91 Floating aquatic. Near Lake Wairarapa, southern North Island; an ephemeral wetland where a long period of shallow ponding and moderate to high fertility have fostered a phase of dense herbs and grasses. The red vegetation is a dense pool-surface coating of free-floating plates of retoreto along with tiny green platelets of duckweed. Floating retoreto (*Azolla filiculoides*) - duckweed (*Lemna minor*) fernland, ephemeral wetland; palustrine.



Fig. 92 Floating aquatic. Taramakau Valley, Westland; a swamp pool with pondweed (*Potamogeton cheesemanii*), its floating, water-repellant leaves held upon stems which are bottom-rooted, even at depths of 2 m or more. Floating pondweed herbfield, shallow water; palustrine.



Fig. 93 Rafted aquatic. Waihola-Waipori wetlands, east Otago; a swamp channel bordered by giant sweetgrass (*Glyceria maxima*), rooted on, or closely beneath, the shore, but with buoyant stems and foliage extending as a raft several metres across the water. Rafted giant sweetgrass grassland, shallow water; palustrine.



Fig. 94 Rafted aquatic. Birchfield Swamp, near Westport, Buller; a raft of swamp vegetation that cannot be walked upon and hides the deep pool of water beneath. The pool surface has been covered first by a mass of stems and foliage, partly emergent, of milfoil (*Myriophyllum robustum*; centre foreground). This has been colonised by the perching pale-green tufts of the sedge *Isolepis prolifer*. Rafted milfoil herbfield, shallow water; palustrine.



Fig. 95 Submerged aquatic. Kaimai Range, Bay of Plenty; a stream crossing an upland forested plateau, where the gentle gradient, steady flow, and relatively low sediment load allow for the growth of dense clumps of charophyte algae that are attached to stream bed gravels and permanently submerged. Submerged charophyte algalfield, shallow water; riverine.



Fig. 96 Submerged aquatic. Garvie Mountains, northern Southland; a stream head emanating from alpine seepages, the stream rocks being vegetated with black aquatic lichens (*Verrucaria* spp.) and the shallow margins with mosses, a demonstration that many groups of non-vascular plants contribute to submerged aquatic communities. Submerged *Verrucaria* lichenfield, shallow water; riverine.



Fig. 97 Submerged aquatic. Tongariro River, Volcanic Plateau; a shallow stony pool of a river flood channel where the living matter is composed of attached films and suspended masses of iron bacteria which gain their energy by decomposition of organic matter and oxidation of iron. Submerged bacteriafield, shallow water; riverine.