

BOOK REVIEWS

Flora of New Zealand. Volume III. Adventive cyperaceous, petalous and spathaceous monocotyledons. A.J. Healy and Elizabeth Edgar, 1980. Government Printer, Wellington, 220 pp. Price \$18.50.

The most daunting part of the third volume of the Flora of New Zealand is the subtitle: "Adventive cyperaceous, petalous and spathaceous monocotyledons". Presumably this is an attempt to be more positive than the somewhat negative, if more easily understandable, alternative: "Introduced monocotyledons except grasses". Otherwise the amount of jargon mercifully is reduced. Each successive volume of the flora has produced a shorter glossary, a trend that must be applauded.

Volume III is written by two botanists who are particularly well-qualified. Mr Healy has a background in agriculture and has spent much of his career studying adventive weeds, and Dr Edgar is a taxonomist who has studied the monocotyledons intensively. The book they have produced is a thorough and well-researched taxonomic account. It is clearly printed on quality paper which should stand the rigours of heavy use.

Following the preface is a section listing the Annals of Taxonomic Research on New Zealand Tracheophyta (plants with vascular systems for the conduction of food and water) which covers the period 1969-76 with a few earlier papers omitted previously. I have found this to be a most useful feature of the floras and I am glad that it is continuing. This is followed by a short list of abbreviations, an index of authors' names, and a bibliography of the literature of first records for adventive plants.

The main body of the text begins with a synopsis of orders, families and genera based largely on the system of Hutchinson, the system also used in earlier volumes. There follow three dichotomous keys. Two are conventional keys to families and genera of monocotyledons respectively and based mainly on reproductive characters. The third key is based on vegetative characters, a useful innovation. The descriptions of families, genera and species follow and occupy 178 pages out of a total of 220.

The book concludes with a glossary, a corrigenda to the first two volumes and an index of scientific names. Volume II was remarkable for the few errors. Volume III seems to be equally well-proofed.

In the preface the authors comment on the division which has long bedevilled New Zealand botany. Floras here have traditionally been

concerned with the native flora to the virtual exclusion of the introduced plants. This has created the situation in which my students often regard the native species as symbols of oppressed virtue and the introduced species as nasty, aggressive usurpers, not worthy of consideration. It is an uphill task to persuade them that they are all members of the flora now and should be given equal consideration. Furthermore, such division requires that the worker in the field be able to differentiate the native from the introduced, which is an impossibility. The authors comment on this division in the preface and observe that Volume III is a transition stage to a complete integration of the flora.

The transition consists of synopsis and keys to all natives and adventives down to the generic level. Where a family contains a mixture of native and adventive genera there is a key which includes both but the reader is referred to Volume II for further information on the natives. Where a genus contains a mixture of native and introduced species there is a key which includes both. This is followed by full descriptions of the introduced species and abbreviated descriptions of the native species. Once again the reader must refer to Volume II for the full descriptions.

This results in the curious situation in which the reader wishing to identify an unknown monocotyledon must refer to two books simultaneously. I do not know of any similar situation elsewhere in the world. Elsewhere floras contain both native and introduced species and in many countries it is impossible to differentiate them. I believe that an opportunity has been missed to integrate the native with the introduced. What ought to have been published was not Volume III but rather the second edition of Volume II. I am inclined to think that this was not done either for reasons of publishing economics or because of an unwillingness to see Volume II made obsolete after only ten years.

However in other sciences such as biochemistry it is not the least bit unusual for textbooks to be redundant after ten years or less. The authors have clearly put much care and effort into the production of Volume III, and it would have required relatively little extra effort to integrate fully. After all, the descriptions and keys are already written. I concede that to have completely integrated would approximately double the length of the book but at least the end product would be much more lasting.

Very generous criteria have been adopted for defining an adventive species in Volume III. Where to draw a line between garden outcasts and

adventives has been a problem, and many species have been included on the basis of a single collection although mention of these is usually confined to small print. In the preface it is claimed that all species which have been collected more than once have been given a full description but in practice this does not seem to have been the case, for example *Vallisneria spiralis* and *Allium ampeloprasum*.

Each species description is accompanied by information on the distribution of the species. Unfortunately the geographical names used do not always correspond with the maps at the end of the book. Informal regional names such as Waikato and Manawatu are used in the text. The maps show the provinces of North Auckland and South Auckland with Auckland city occurring in the former. The text refers to North Auckland and Auckland provinces with Auckland city placed in the latter. This is potentially confusing to visiting botanists from overseas.

A pleasing feature of Volume III is the increased use of line drawings which are most beneficial to those who are learning the flora and who find it hard to visualise some of the descriptive terms. I am less convinced of the value of coloured photographs as the colour and "the imperfections of nature" tend to obscure the botanically important features.

A further pleasing feature is that, within each family, the genera are arranged alphabetically. May I suggest to all taxonomists and writers of floras that these works are used mainly by non-specialists. Therefore, it would make it much simpler for the user if the families were placed in alphabetical order also. Hutchinson's scheme is followed here but there are other schemes and taxonomists disagree as to which is best. Indeed the whole basis upon which plants are classified is subject to criticism (Parenti, 1980). In these circumstances, it is quite unfair and confusing to inflict these notions on beginners and non-specialists. A flora should be a convenience rather than a test of taxonomic knowledge.

I am told unofficially that we may expect a volume on the grasses that is fully integrated and two volumes to cover the introduced dicotyledons. For reasons that must be apparent I look forward to the grass volume but I am somewhat apprehensive about the other two volumes.

REFERENCE

- PARENTI, LYNNE R. 1980. A phylogenetic analysis of the land plants. *Biological Journal of the Linnean Society* 13: 225-42.

Pauatahanui Inlet- An Environmental Study. Co-ordinated by W. B. Healy, 1980. New Zealand Department of Scientific and Industrial Research, Information Series 141. Wellington. 198 pp. 105 figs, 8 coloured maps. Price \$25.00.

The 'Pauatahanui Inlet - An Environmental Study' is a remarkable book for the breadth of its treatment. It reports the results of a scientific programme set up in response to concern about the effects of development in the Pauatahanui catchment. The D.S.I.R. was responsible for the study via the Pauatahanui Environmental Research Committee. The objectives included an attempt to understand the ecosystem, to define sensitive features, to produce data of use to planners to enable wise management and to establish baselines for monitoring changes resulting from development. What is new and encouraging about this study is the environmental unit that was selected for study - not a particular species or habitat, but a whole ecosystem. Other government scientific groups (e.g. Forest Service) are also beginning to look at environmental research in a new and more fruitful way with their catchment/stream studies.

Thirty-five scientists were involved in the study of catchment vegetation, sediment, early history, hydrology, fauna and flora of the inlet, climate, physical oceanography, pesticides, heavy metals and planning. The work carried out was considered to be a 'first phase' exercise. Apparently each scientific group did its own thing and left it up to Dr Healy to bring it all together. While it is unique to have so many different scientists working in the same ecosystem simultaneously the way in which this happened at Pauatahanui should not be regarded as the ideal and a model for the future. A higher degree of integration of the different groups, each focussing on obtaining answers to questions about the system and its properties, might well achieve more benefit for the effort involved. Many scientists upon reading that the whole project cost around \$400,000 will 'tear their hair out' when they think what *THEY* could have done with that amount of money. But of course the real cost of the project must be much larger because of all the equipment that was involved as well. Hopefully if another study of this type is carried out again it will not waste time covering old ground but will begin where the Pauatahanui Programme left off.

The report aims to inform the community at large rather than just the scientific community. This is a difficult task indeed and has resulted in a document that perhaps does not satisfy either group. However, Healy is to be congratulated for his efforts

to bring scientific research to the attention of non-scientists. How many members of the public will actually bother to read this report is hard to guess.

The price may put some people off. However given wide circulation the aim of promoting public awareness should be achieved.

Members of the public should be interested in this report if they are concerned about estuarine degradation and the consequences of urban development in the catchment. The Pauatahanui Catchment is 105.5 km² of which two-thirds is grassland. In the 1840's it was two-thirds native forest so that what has happened in the last 140 years is typical of the rest of New Zealand. Saddlebacks and stitch birds were still present when the early Europeans arrived and prior to the arrival of the early Maoris there were several species of moa. The giant moa *Dinornis giganteus* was killed and eaten at Paramata between 1350 and 1450. The report reminds us that estuaries are ultimately transient and that if natural accretion proceeds at the present rate of 2-3 mm per year then the inlet will be filled in in perhaps another 1000 years. It is interesting that despite the changes in catchment vegetation, the rate of sedimentation does not appear to have changed for the last 6-7000 years.

As an ecologist I must comment on the biology section in more detail. It is mostly a list of species with notes on their habits; biologists will not find much that is new because most of it can be found in Morton and Miller (1973). It is to be hoped that the scientific papers that are supposed to appear will tell us a great deal more. The food web for the inlet on p. 141 seems to include most of the sources of nutrients and energy but, strangely, it does not include any exports of nutrients or organic matter (alive or dead) in the water. Only large carnivores are shown as losses from the system and yet planktonic larvae and plants must also be exported. The reader is left with the impression that the inlet system is self-contained, recycling nutrients and degrading energy as fast as it is fixed by the autotrophs. This is certainly unlikely to be the case.

A useful article by Paul Kennedy summarising some of the main features of Pauatahanui Inlet has also appeared in *Soil and Water* (October 1980, 16(5): 7-10). According to a recent letter in the same magazine (February 1981, 17(1): 2) a significant error in the calculation of sediment discharge from Brown's stream was made in both the October article and in Table 7, page 80 of the original report.

In conclusion I hope that this report will be widely read by both scientists and members of the public, especially those involved in administration,

management and care of New Zealand's coastlines. May one also hope that it might have some impact in the area of environmental legislation and be of use in helping legislators sort out the 'jungle' of 16 or 17 acts that define responsibilities and control the management of coastal areas.

REFERENCE

MORTON, J.; MILLER, M. 1973. *The New Zealand Sea Shore*. Collins, Auckland. Revised Edition.

C. L. McLay

The Resources of Lake Wanaka. B. T. Robertson and I. D. Blair (Eds). Lincoln Papers in Resource Management No.5, 1980. Tussock Grasslands and Mountain Lands Institute, Lincoln College. 66 pp. Price \$6.00.

This attractive work contains ten articles by New Zealand scientists and an introduction by R. W. Cleland, formerly Chief Ranger, Mt. Aspiring National Park. A preface outlines the purposes of the Lake Wanaka Preservation Act 1973, and the functions of the Guardians of Lake Wanaka who commissioned this book. The scientific articles include four dealing with the physical and geological setting of the lake, climate, weather and water chemistry and six concerned with biology. These cover fish, aquatic and shoreline vegetation, wildfowl and "swimmers itch"; but except in passing there is no mention of the plankton, benthos or littoral invertebrate fauna. The book is nicely laid out with a colourful cover and good use of photographs, graphs and maps. The schematic figures of vegetation distribution put across their message well.

The General Introduction provides a brief history of European association with the lake but its main purpose is to provide "an outline of the events and negotiations within the Wanaka community that gave impetus to government action, bringing about safeguards for the region with respect to the environment and its resources".

Jack Irwin provides a clear account of the lake morphology, well illustrated by maps, echo-sounder traces and a figure giving lake water temperature profiles. The geological setting is provided by I. C. McKellar while S. J. Reid gives exhaustive, long-term climatic data for Wanaka, Alexandra and Lake Hawea. Chemistry Division, D.S.I.R., provide four tables of water analyses made at 11 sites in 1975-76 and V. M. Stout comments on the data and points out some of their salient features.

The first biological paper, by Brian Coffey, is an important, attractively illustrated account of the aquatic macrophyte problems in Lake Wanaka and the progress (up to 1977) of the *Lagarosiphon* containment programme initiated during 1974 using the herbicide diquat. *Lagarosiphon major* grows up to 6.5 m high in New Zealand and is capable of forming "veritable underwater forests". It competes best in oligotrophic waters and Coffey considers that if its spread is not checked it will come to dominate the climax vegetation in Lake Wanaka on submerged sites between 0.5 and 6.5 m. Eradication of the plants at present relies on hand-picking and suction dredging, and Coffey makes a plea for the commitment and cooperation of researchers, managers and the general public to give the containment programme a real chance to succeed.

Two papers, by D. W. Featherston and Shirley Rind, discuss the life cycle of the trematode causing schistosome dermatitis (swimmers itch) in humans. The first author comments on incidence of snail infection in the lake during the 1970s while Mrs Rind discusses her own work in progress and suggests that more than one organism (i.e., not only the well known *Cercaria longicauda*) may cause the dermatitis. Both authors discuss chemical control measures pessimistically although Mrs Rind pins her faith on "the new molluscicides being developed" as possible agents for the destruction of young *Lymnaea tomentosa*, the snail intermediate host.

A most informative account of the past and present state of the brown and rainbow trout and quinnat salmon fishery in the lake is given by R. T. Hutchinson. He identifies the need for wise development in the Wanaka drainage basin in order to maintain the quality of the fishery and emphasises the desirability of maintaining naturally fluctuating lake levels. D. Murphy follows with descriptions of the birdlife around the lake, their whereabouts, habitats and the shooting season.

Finally, P. N. Johnson describes the shoreline flora from the waterline where Coffey leaves off to an altitude of 800 m where bracken and rough pasture give way to tussock grassland. In addition to a species list and transect diagrams, simple drawings of many of the plants are provided and should prove invaluable to the visitor wishing to identify them.

All in all, this is a useful and thoroughly worthwhile publication. It should be of interest to many aquatic biologists and I hope that it will be available to visitors who visit Lake Wanaka and want a readable introduction to its natural history.

Michael Winterbourn

Ecology of a Subarctic Mire. M. Sonesson (Editor), 1980. Ecological Bulletins No. 30, Swedish Natural Science Research Council, Stockholm. 313 pp. Price .c. US \$30.00 from Editorial Service/NFR, Box 23136, S-104 35 Stockholm, Sweden.

This book is an account of the investigations undertaken as part of the International Biological Programme Tundra Biome Project. Twenty-four sites around the world have been studied as part of the programme, the three Southern Hemisphere sites being on the islands of South Georgia, Signy and Macquarie. The study area dealt with in this book is at Abisko, Northern Sweden, a tundra mire on permafrost.

The contents consist of fifteen scientific reports by eighteen authors in various combinations. The reports cover the physical characteristics of the mire and its environment, the supply of some macronutrients to the mire and the fluxes of nitrogen and carbon within it, the "photosynthesis" and productivity of *Andromeda polifolia*, *Rubus chamaemorus* and *Sphagnum*. and ending with an energy flow analysis of the mire. My first impression was that the research had not been fully co-ordinated and that there were gaps in the study. However, the Appendix revealed a bibliography of previous publications which filled in many of the gaps. This book is not therefore a complete account of the work done at Abisko but rather a collection and reworking of some previously published material plus some additional information. Combining the present book with the previous literature does give a reasonably complete picture of the mire, and the mosses and some dwarf shrubs growing upon it.

However, other plants, e.g. *Vaccinium* spp., *Eriophorum vaginatum*, have received rather scant attention.

This book is unlikely to have widespread interest in New Zealand. The study site is too far away and most of the plants are unfamiliar. While it is a useful introduction to much of the work on mire ecosystems in Scandinavia in recent years, interest in it will probably be confined to a few main libraries and specialist research workers here.

A. T. Dobson

The Land Our Future. Essays on land use and conservation in New Zealand in honour of Kenneth Cumberland. Edited by A. Grant Anderson, 1980. Longman Paul, Auckland, 324 pp. Price \$24.95 hbk, \$19.95 pbk.

Published to mark the retirement in 1978 of Kenneth Brailey Cumberland, foundation Professor

of Geography at the University of Auckland, this volume prevents diverse views on our land resources, their wise use and the consequences of unwise use. Fifteen invited essays range from ecological and economic principles in land use allocation; land resource data gathering from satellites; past and current use of soil, forest and water resources; agricultural efficiency and innovation; mountain land erosion and extensive pastoralism; land use conflicts at the urban and coastal fringes to trends in rural and small town population. These loosely represent Kenneth Cumberland's own wide interests during a distinguished academic career.

The book opens with a biographical outline by Grant Anderson, who goes on to define principles of conservation, resource management and land use in New Zealand. A closing chapter entitled *A Future for Agriculture* is devoted to Cumberland's own stirring words. Three extracts from recent addresses give firstly, a poignant evocation of New Zealand landscape and people in the late 1930s and early 40s, a critical assessment of livestock farming and its future and finally a challenging view of the future for a diversified agriculture.

In a down to earth essay, Alan Mark, a politically effective conservationist, shows his concern for ecological principles in land use allocation. Advocating multi-objective planning, Alan seeks the use of ecological understanding in managing such vulnerable habitats as high country, native forests, coastal zones and urban fringes. A plea is made for preservation of representative ecosystems and aesthetic values "to maintain the integrity and inherent beauty of the landscape".

A brief but effective contribution from Brian Murphy advances the economic principle of opportunity cost and uses production possibility curves to demonstrate choice between competing land uses. From surveys, he shows that New Zealanders may well accept reduced growth in economic standard of living in order to divert some resources to improving social and environmental standard of living.

Chapter 4 is a comprehensive review of land resource data acquisition from space satellite photography. Ross Cochrane shows in detail that remote sensing is more than just pretty pictures. Space-age terminology is confusing but Ross soon has the reader absorbed with results of imagery beamed from LANDSAT, SEASAT, NIMBUS-7, SKYLAB and other earth resources satellites. A group of 17 colour plates accompanies his essay. Unfortunately, though the colour printing is generally very good, several plates are rather small and do not display all the features which Ross

assures us are there. However, plates 4.5 of central North Island, 4.10 of eastern South Island and 4.19 of central South Island are striking examples of results from this remarkable new technology.

The section of colour plates and maps is followed by a brief survey of New Zealand's soil resources and their potential uses. The authors M. D. Leamy and D. M. Leslie show the value of soil information in national planning objectives for specialised crops, irrigation and urban suitability.

Frank Newhook reviews present use and future prospects for indigenous forests. His essay covers the major changes in policy for state indigenous forests which occurred from 1974 until 1978. This is a fair-minded review of the position in which the Forest Service finds itself regarding the last 652,000 ha of virgin lowland production forest belonging to the State. He also acknowledges the increase in public participation in forestry decisions. "Today's arguments for conservation are more and more factual and expertly organised, often in the hands of bodies such as Native Forests Action Council, whose *Maruia declaration* is fast becoming a standard in the battle to stop or reduce exploitation of our country's remaining native forests". Professor Newhook points out that privately-owned forests, mostly Maori-owned, are less affected by the Forest Service indigenous policy. Sadly such areas appear destined to be lost by logging.

Paul Williams provides quantitative hydrological evidence of the impact of man in changing forests to grasslands and vegetated land to residential suburbs. Earth surface processes are particularly rapid in our youthful landscape and Williams gives case studies such as the catastrophic erosion and sedimentation since deforestation in the Waipaoa Basin inland from Gisborne. He concludes with some valuable guidelines for land development and water quality control.

The essay by Ian Simmers deals with problems of regional water resources estimation. New Zealand surface water resources are estimated and mapped. Areas with limited surface water tend to coincide with geological structures which hold sufficient ground water for present needs. Simmers goes into mathematics to test the precision of new parameter estimates and looks in detail at the water resources of the Upper Taieri River, Otago.

Grant Pearson and Philip Corbet make a timely and perceptive approach to economic and energy efficiency of our agriculture. They conclude that New Zealand animal production based on grass/clover pastures is relatively energy efficient. Nevertheless future intensification will need to avoid

energy-expensive agricultural technology. The recent innovation of forest farming receives some clear-sighted attention from John Tustin, Leith Knowles and Bert Klomp. A future projection of 225,000 ha in grazing forestry over the next 25 years gives the hope of \$200 million a year in extra export earnings. Hopefully this can be achieved without loss of pastoral production.

Otago's Professor Ron Lister gives a blow by blow account of the conflict over hydro-electric power from the Clutha River. He demonstrates clearly the persistent refusal of central government to heed expert advice to proceed on the basis of multiple use planning. His conclusion is that "the national interest in producing power from the Clutha appears to have been overriding some of the strong regional interests in the Clutha Valley". A twist to the tail is that Clutha power now appears destined for the controversial second aluminium smelter at Aramoana in Otago.

Geographer Warren Moran contributes an analysis of the ways in which farm land has been allocated to urban expansion around Auckland. His colleague, Warwick Neville, quantifies spatial patterns of population change in rural areas in small towns. An earth scientist, Terry Healy, introduces coastal resources and the recent loss of coastal subdivisions through beach erosion. Such losses stem from failure to properly evaluate and heed coastal geology.

To my mind the best essay is contributed by Kevin O'Connor. As Lincoln College Professor of Range Management he displays impressive scholarship in his review of New Zealand experience in the use of mountains. Kevin's writing is a rich blend of scientific synthesis and poetic lyricism. He has honoured Kenneth Cumberland by a careful reappraisal of the "myth" for which he is perhaps best known; that of accelerated erosion caused by high country pastoralism. Earlier, Cumberland himself had "contributed substantially to remoulding the myths of pre-pastoral vegetation stability by his review of the role of Polynesian man in destroying forests of the moa-hunting period, identifying cultural interference rather than climatic change as the major force in the making of the extensive South Island tussock grasslands". He concludes with a penetrating history of European pastoral impact. The eruptive model of wild herbivorous mammals introduced to this country is shown also to "accommodate the pastoral sheep industry on native range. . .". By 1951 the apparent carrying capacity of unimproved tussock grasslands in Central Otago had fallen to 10% of that existing in 1881. Since 1951 dramatic improvements have been occurring in what some have called the 'high country

revolution'. These are illustrated and a national perspective for the future ends with a reading from J. K. Baxter's moving poem *The Mountains*.

The Land Our Future contains much worthwhile discussion on contemporary environmental issues. Interactions between man, land and nature are shown to be complex but capable of being understood. However, the lengthy gestation period of the book has meant that some of the discussion has been overtaken by recent events, for example, Forest Service policy on indigenous forests and the use of Clutha Valley power.

Apart from the colour plates of satellite photographs, soil profiles, and maps of New Zealand soils and forests, only four essays are illustrated. This relative absence of visual cues is a major fault in an otherwise immaculately presented volume.

Readers may be disappointed to find no essay about exotic forestry and the growth of its *Pinus radiata* monoculture at 40,000 ha a year. For that matter there is little on conservation of wilderness landscapes. But the editorial committee do not consider the contents to be an exhaustive study, merely a diversity of viewpoints on the central issue of the wise and efficient use of land.

No doubt *The Land Our Future* will be compared with the provocative and profusely illustrated *Land Alone Endures: Land Use and the Role of Research* compiled in 1980 by Les Molloy for the D.S.I.R. I feel they are complementary rather than competitive and should be kept together in the frequently consulted part of the bookcase. Though they are not text books both works deserve to be widely used by teachers in secondary and tertiary education.

Kenneth Cumberland's critical approach occasionally raises defensive hackles while others are inspired. However, occasionally we must disagree with his forthright opinion as in the following: "The Land Use Advisory Committee has been deafeningly silent on the question of increasing the *productive* use of land, apparently being much more concerned about 'urban sprawl', with the blight of the 'ten acre' subdivision, and with the negative notions of 'protecting' prime land and the 'preserving' of land for non-productive uses such as recreation, soil conservation, wildlife and ecological management". Increase the productive use of appropriate land we must, but the 'non-productive uses' need equal attention in order to improve the social and environmental standard of living for all the population.

Professor Cumberland has strongly influenced our attitudes to land and its proper productive uses for 40 years. *The Land Our Future* is a fitting tribute to a man of outstanding intellect and humanity.

Gavin Daly