Forest and Bird

JOURNAL OF THE ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NEW ZEALAND INCORPORATED

OBJECTS OF THE SOCIETY

To advocate and obtain efficient protection of our native forests and birds, the preservation of sanctuaries and scenic and other reserves in their native state, and to enlist the practical sympathy of both young and old in these objects.

The Kea
(Nestor notabilis)

Photo: National Publicity Studios

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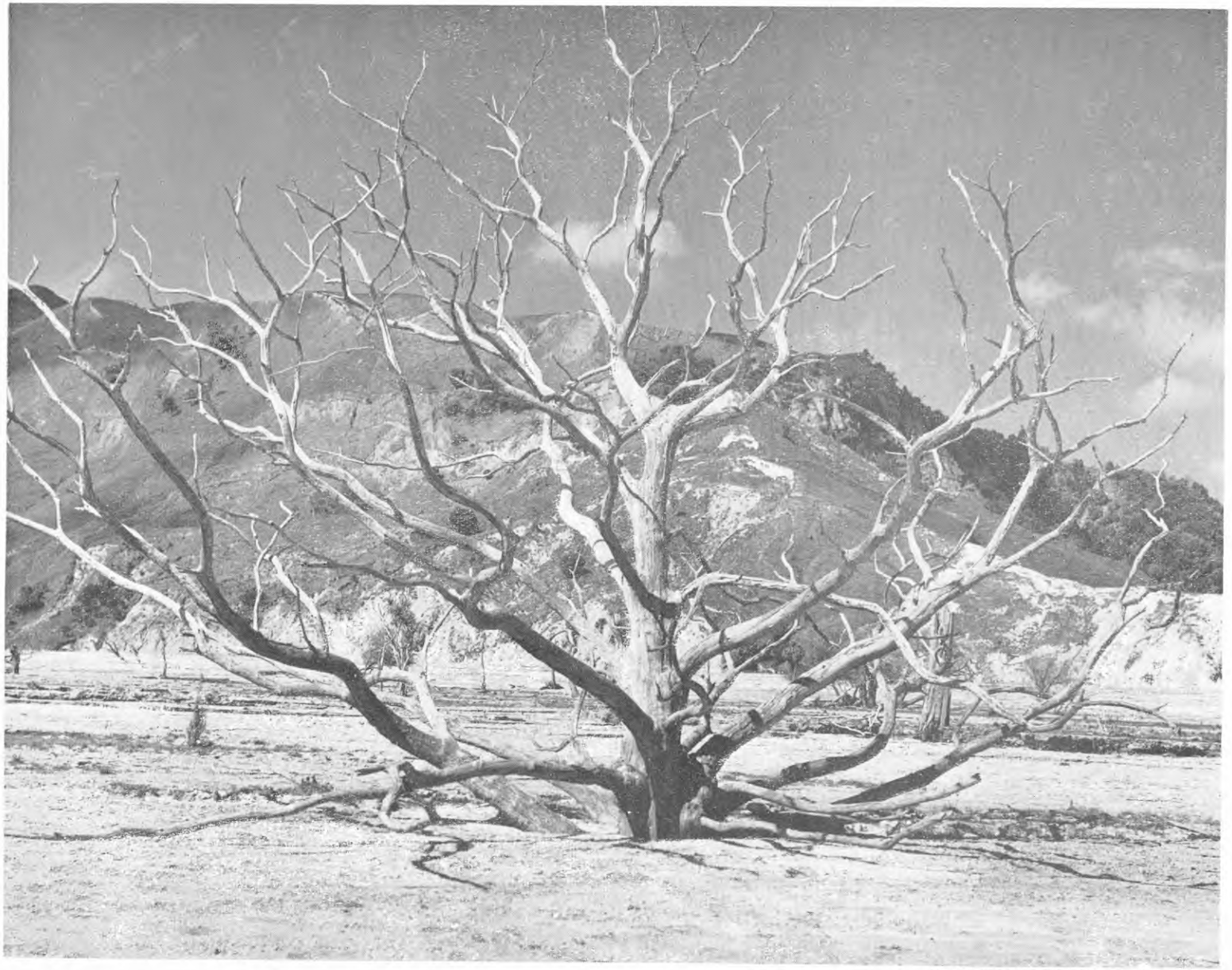

Photo: National Publicity Studios

Trees on a river flat killed by shingle, brought down as the result of erosion of the high country and smothering the low-lying land. In this valley, shingle to a depth of 48 feet has been deposited in 14 years. (Upper Waipaoa River, Poverty Bay.)

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(FOUNDED 28 MARCH, 1923)

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AN AMENDMENT NEEDED

In this issue there appears an article kindly supplied by the officers of the Soil Conservation and Rivers Control Council. It is true as stated in the article that our work and the work of the council have a good deal in common. We believe that conservation of the indigenous bush on our steep protection slopes, or replacing it where it has been destroyed, is of the greatest importance in regulating the flow of water and reducing the flood menace.

Soil and water conservation is tremendously important for every citizen of New Zealand because so much of our overseas income has its origin in the soil. Without it we should be in a sorry state indeed—the high standard of living we enjoy would be quite impossible.

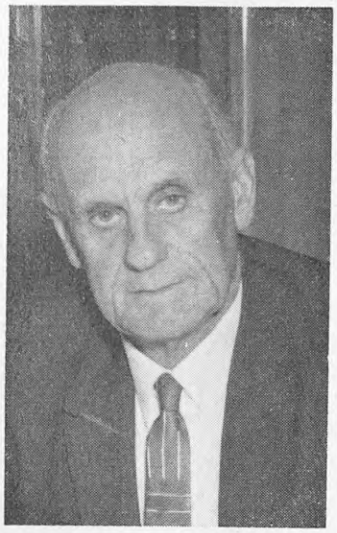
The Soil Conservation and Rivers Control Council is doing splendid work within the framework of the Act, but unfortunately there is a curiously shortsighted omission in the Act in that it does not require the council in its operations to give consideration to the needs of wildlife. The council cannot withhold assistance from the draining of freehold or leasehold land, or unalienated Crown lands, no matter what the effect on wildlife of the proposed works, as long as there will be an adequate economic return. Undoubtedly there is within the organisation a good deal of sympathy for wet-land wildlife. The council has requested the catchment boards to do what they can to modify schemes slightly in order to retain valuable waterfowl habitat, but this should be mandatory under the Act. Our vision should not be limited by economic considerations alone; there are others. Wet-land bird life is one of our natural resources, and when the glitter has worn dull on the economic picture it may well be that too late we shall see we destroyed a much more valuable asset when we permitted the wholesale destruction of wet-land-bird habitat.

During the past century tremendous increases in world populations have been the cause of shocking destruction of wildlife, but wise individuals and powerful organisations are now endeavouring to obtain for all creatures indigenous to any land space the right to live. An amendment to the Act to make it mandatory for the Soil Conservation organisation to give consideration to wet-land wildlife would supply the balance it now lacks; it would enable a good job to be done with consideration for all values involved and remove the reproach that when the Bill was drafted it failed to give heed to the concept now established that wildlife has a place, and a not unimportant place, in the general order of life.

A BROAD PERSPECTIVE

Our Wanganui Branch has two projects in hand which deserve support from all members of our Society. The first is their desire to preserve for the benefit of members, and for the people of Wanganui in particular, the residence and gardens at Bushy Park, alongside the bush area of 214 acres given to the Society by the late Mr. G. F. Moore. Our Council met in the fine old homestead shortly before Easter, most of the Councillors spending a night there. All were warm in their expressions of delight at the beauty of the garden and the wonderful view from the residence. To preserve the great house is an ambitious project, but Wanganui believes it can be done. It is certainly worth doing, just as certainly as it can be done if they have the good will of all members.

The other project is, of course, the lodge on Mount Ruapehu. Little doubt exists that the lodge will be a fine asset which will help in no small way to bring members together and to encourage others to join. The experience of other organisations has been that, once established, good lodges more than pay their way, and it is intended that the lodge will be a good one. If all members will help just a little the lodge will soon become a reality, and under direction of the Wanganui Branch it will be available for the use of members from any part of New Zealand.



Message from the Hon. W. S. Goosman

Minister of Works

(in charge of Soil Conservation and Rivers Control Council)

Two of the primary purposes of the Soil Conservation and Rivers Control Council are conserving soil and minimising damage by floods. As adequate forest protection is one of the means of preventing soil erosion, this work fosters the maintenance of shelter for many of our birds. The Council also actively assists in the destruction of noxious animals, thus encouraging bird life and helping to maintain forest cover.

Realising that water fowl fill an important place in the scheme of things, the Council is always happy to see farmers and acclimatisation societies developing abandoned river courses, borrow pits, or farm ponds for the use of wildlife.

I recognise the great work the Royal Forest and Bird Protection Society is doing towards preserving our native forests and birds. Much of this work is among young people and has a good effect, not only in encouraging the preservation of native birds and forests, but also in developing a knowledge and appreciation of the New Zealand countryside. This is also in keeping with the objects of the Council.

The invitation from the Society, to outline in this issue the work of the Soil Conservation and Rivers Control Council, is greatly appreciated.

W S Goosman

The Work of the Soil Conservation and Rivers Control Council

The Soil Conservation and Rivers Control Council became established on the enactment of the Soil Conservation and Rivers Control Act in 1941. This is an act to make provision for the conservation of soil resources and for the prevention of damage by erosion, and to make better provision with respect to the protection of property from damage by floods.

Object of the Council

The general objects for which the council is established are defined in the Act as:

(a) The promotion of soil conservation.
(b) The prevention and mitigation of soil erosion.
(c) The prevention of damage by floods.
(d) The utilisation of lands in such a manner as will tend towards the attainment of the objects aforesaid.

The objects of the Royal Forest and Bird Protection Society are to advocate and obtain efficient protection of our native forests and birds and the preservation of sanctuaries, and scenic and other reserves, in their native state, and to enlist the practical sympathy of both young and old in these objects.

The objects of the two bodies naturally differ but they have a great deal in common, and the activities of each help the other in attaining its objects. The efficient protection of our native forests and of the native birds that assist them to thrive, which are objects of the society, help the work of the Soil Conservation and Rivers Control Council because adequate protection forest is one of the means for preventing soil erosion. On the other hand, the work of the council to conserve the soil and to prevent damage to the land by floods aids the aims of the society by fostering the maintenance of a healthy vegetative cover, which provides the habitat of many of our birds. Further, apart from the direct effect of the council's work in encouraging the preservation of our native forest in fulfilment of its own objects, there is an important additional effect: all work to conserve soil and to prevent damage by floods helps the fuller use of the land for many necessary purposes and so reduces the demand for the further clearing of native forest to provide more land for agricultural and pastoral purposes.

The information given in the rest of this article will give members of the society a better understanding of the work of the Soil Conservation and Rivers Control Council and of how this is related to the work of the Royal Forest and Bird Protection Society.

Historical Background

The indigenous vegetation of New Zealand developed in the absence of grazing or browsing mammals, the only vertebrate inhabitants of the land before the coming of the Maoris being birds, some of giant size, and two species of bat. With the coming of the white man the country, in little more than a century, suffered a tremendous ecological upheaval. Europeans introduced sheep and cattle to graze the native grasslands and later deer and opossums into the forests. Where grasslands were depleted the introduced rabbits thrived. Exotic grasses better able to support grazing animals were introduced and large areas of forest were cleared and sown to grass. This caused geological repercussions in a land already unstable, and there was a noticeable readjustment of slopes, particularly in the softer Tertiary mudstone country. The development of high-producing pastures, the clearing of native forests, and the draining of swamps led to the more rapid run-off of rainwater and stream channels became inadequate.

There have always been flooding and erosion and the two processes have produced New Zealand's fertile plains. The economic development of these plains, as in other parts of the world, has made it desirable to control these natural processes and slow down the rate of change. Almost from the beginning of settlement, works were carried out to alleviate flooding and river erosion, and various bodies were set up to control water. Even before the turn of the century some far-sighted observers recognised the incidence of accelerated land erosion; but it was not until the 1930s, when world-wide interest in the subject was aroused by disastrous dust storms in the United States. that serious consideration was given to soil

erosion. This led to the passing in 1941 of the Soil Conservation and Rivers Control Act, which recognises that soil conservation and the control of water in its widest sense are interrelated problems.

Organisation and Functions

This Act not only established the Soil Conservation and Rivers Control Council but also provided for catchment boards to be set up as the local executive bodies to plan and carry out works. Among the subsequent amendments provision was made in 1959 for catchment commissions in areas where the problems did not justify a catchment board. Commissions are more under the direct control of the council and the difference between a board and a commission may perhaps be illustrated by saying that a catchment board has "dominion" status whereas a catchment commission is a "colonial" administration. Government members are appointed to both types of authority; but the other members of catchment boards are elected whereas those of catchment commissions are appointed by the counties and boroughs in the area. The Soil Conservation and Rivers Control Council itself reports to the Minister of Works and is administered by his department, which also advises the council on engineering matters; the Department of Agriculture advises it on soil conservation. In addition to Works and Agriculture, the Department of Lands and Survey, the Forest Service, and Treasury are also represented on the council. The remaining members are appointed by the Governor-General to represent catchment boards, county councils, borough councils, river boards and drainage boards, areas outside catchment districts, and agricultural and pastoral interests.

The statutory functions of the council arise from the objects of promoting soil conservation, mitigating damage by erosion or flooding, improving drainage, and controlling water so that land may be used to fuller advantage. The council is charged with the coordination of Government departments to achieve its objects and is required to provide a hydrological service and publish information. No mention is made of preservation of wildlife and the council has no power to withhold assistance arbitrarily from those who wish to drain lagoons and other water-bird habitats. On the other hand, the council is always pleased to see farmers and acclimatisation societies develop for the use of wildlife any incidental areas of water that may result from the schemes it subsidises. These may be abandoned river channels, borrow pits, or farm ponds.

No financial aid is granted for this wildlife development.

Photo: Department of Agriculture

A young, actively developing finger gully.

Photo: Department of Agriculture

A gully at a more advanced stage of development.

Photo: N.Z. Forest Service (J. H. G. Johns, A.R.P.S.)
In the Blowhard area, west of Napier. Wind has eroded the surface pumice soil and the run-off of water has caused gullying to follow.

Although individual works are necessary to deal with small urgent problems, catchment authorities are expected to promote comprehensive schemes to control long lengths of rivers or, for soil conservation, to organise farm-conservation plans over groups of farms covering whole catchments. In this manner the various techniques can be made mutually supporting and results are achieved much more cheaply. Schemes originate from a local demand for improved conditions. Proposals are prepared by the local body, discussed with the prospective ratepayers and submitted to the Soil Conservation and Rivers Control Council for approval and the granting of a subsidy. The Act requires that the local share of the cost be assessed on the basis of benefit received and rates are graduated accordingly.

An essential part of each proposal is an economic report on the benefits that will result. In the case of river-control schemes, these consist of prevention of losses and of increases in production following the land improvement that better control of water makes possible. With soil-conservation works much of the benefit may be "off site", that is, on other lands or river channels that will no longer suffer from the deposit of detritus carried down from above. Nevertheless, it is usual, after the initial development costs have been met, for a farm-conservation plan to result in considerably better returns to the farmer as well as ensuring that the land is managed in accordance with its capabilities to give a sustained yield.

There is no such thing as absolute control of erosion and flooding. Rivers are "biotic" entities whose character is determined by the climate, geology, vegetation, and fauna of their catchments. They are for ever changing, and all that man can do is to guide that change into directions favourable to his own ends. Engineering works are required in the lower and middle reaches to contain floods and to train the river to a stable alignment. Soil-conservation techniques are necessary over the whole catchment to prevent the overwhelming of the river works by detritus as well as to prevent land deterioration. Soil conservation is primarily achieved by maintaining and improving the vegetative cover. There is no end to such operations. Periods of high activity will be followed by longer periods of quiescence, when only works of a maintenance nature are needed; but geological change and economic progress will sooner or later make further major work necessary.

Hydrology

Hydrology is the scientific study of the water of the earth. It was stated earlier that the council is required to provide a hydrological service. This is effected partly through the hydrological work of catchment authorities and partly by the delegation of the main responsibility to the Ministry of Works. The civil-engineering division of that department has a hydrology section in its head office and a hydrological survey that operates in the field throughout New Zealand. The hydrological work of the Ministry of Works embraces the collection of data, the analysis of information, and the publication of results for the national hydrological records; it also involves co-ordinating the hydrological work of other

Government departments and of local authorities.

The purpose of modern hydrological work is to obtain information sufficient for a full understanding of the phenomena of the water of the earth and of the problems involved in the assessment and use of water resources and the protection of these resources. To achieve this purpose hydrological data are, in New Zealand, classified in five broad subdivisions: water resources, river-channel measurements, flood information, suspended sediment and measurements of erosion, and measurements of catchment condition. These last are designed to record the catchment characteristics that influence the run-off produced from a catchment.

The economic significance of water science in New Zealand has been indicated in a recent article by drawing a parallel with experience gained in the United States. It has been estimated that, on the basis of the same *per capita* expenditure in New Zealand as in the United States, the annual expenditure here on works for the use or control of water may reach £50,000,000 within the next few years. The magnitude of this estimated expenditure leaves no room for doubting the value of adequate hydrological data for the proper planning of the work represented. Much of the work in the development of water resources primarily concerns other authorities, but the hydrological work done under the authority of the Soil Conservation and Rivers Control Council is of basic importance to all water management and use. Further, the council's own special activities in soil conservation, erosion prevention, flood prevention, and drainage all depend very greatly for their success on a thorough knowledge of hydrology as well as of agricultural science and engineering.

In the council's own field of responsibility special efforts are now being made to present and interpret hydrological data in ways that will help to develop better scientific methods for the control of erosion and flooding. This is being done by the formulation of standard hydrological procedures and codes of practice that will not only aid field investigations and the design of works but also give a firm basis for the fundamental research work required,

Photo: National Publicity Studios

An aerial view of the upper Taieri River, showing meanders. Meanders tend to progress downstream; abandoned old meander courses can be seen clearly. These abandoned meanders very often remain as lakes or swamps.

for education in hydrology, and for staff training.

In all the work of the council good scientific information is important in another way; to enable the coordination of a complex working effort. Men of several professions—agriculturists, foresters, and engineers especially—are concerned jointly in expert studies and the planning of remedial and preventive works. This complex activity demands a high degree of coordination and mutual understanding, which is only possible on the basis of good scientific information. Hydrology is one of the most important aspects of this scientific background to working cooperation.

There is often genuine doubt as to which are the most important and urgent things to be done in fulfilment of the objects of the council—whether, for example, it is wiser to concentrate expenditure on the upper catchments of rivers or whether downstream protective works should be accorded greater urgency. Such questions have attracted wide public interest. For the best decisions to be made it is essential that reliable scientific information should be available, as only then can problems be solved logically and efforts be properly coordinated. Further, because the land user will always be deeply concerned with both the problems and the proposed remedial action, informative publicity is most desirable; such publicity, to be effective, must be both suitable for the purpose and accurate, that is, based on scientific fact. Again, hydrology is

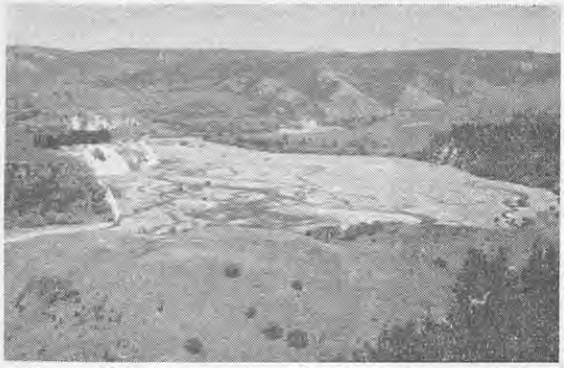


Photo: N.Z. Forest Service (J. H. G. Johns, A.R.P.S.)
A typical river channel in coarse alluvium. The behaviour of a river depends on the interplay of bed material of various sizes, the gradient, the amount of water, the curvature of bends, and so on. By good engineering practices, the height of flood waters can be lowered, and the movement of alluvial material can be lessened. (Ngaruroro River, Hawke's Bay.)

important because hydrological information is perhaps the most fundamental part of the scientific knowledge required in this field of activity.

It will be seen, therefore, that the Soil Conservation and Rivers Control Council has every reason for promoting hydrological work.

The Royal Forest and Bird Protection Society is naturally particularly concerned with watershed protection and will therefore be interested in the published proceedings of a symposium on hydrology and land management held at Lincoln College last year. At this symposium current work and future proposals were discussed. During discussions on the effect of catchment condition on the size of floods it was pointed out that there were some popular misconceptions causing unnecessary misunderstanding. The misunderstanding mostly arises because of a failure to distinguish between small catchments and large ones. Most people are inclined to think that when catchment conditions deteriorate floods everywhere will automatically be greater in magnitude. This is not so, broadly because the changes in water-holding capacity which follow changes in catchment condition are, for most soils, small in proportion to the precipitation of the storms of long duration that give rise to floods in large catchments. On the other hand, the same changes are likely to cause a very significant difference in the run-off resulting from the short intense storms that affect small areas most. Erosive effects follow a different pattern. If the surface condition of a catchment deteriorates badly, especially if the soil is of an erodible type, there will be a very great increase in the rate of erosion caused by any degree of run-off. Erosion depends mainly on the flood run-off of little catchments and, as explained above, the flood run-off from a deteriorated small catchment will be increased, thus further increasing the rate of erosion. These two effects combined result in the greatly accelerated erosion which follows catchment deterioration and which, measured as suspended sediment in the river flow, may well show a hundredfold increase.

Soil Conservation

New Zealand commenced her second century of European occupation with the new responsibility of conserving her land—her main food-producing resource—despite the challenge to its permanence by the ruinous soil erosion that had set in during the first century. Soil erosion in New Zealand is mainly a problem of the hill-country pastoral lands, especially where farming has forced grass to take over the protective functions of the former native forest, fern, and scrub. Some 70 per cent. of the areas of New Zealand occupied for agricultural use is pastoral land that is too steep to be ploughable. Much of this demands special conservation methods of farming because of the serious pasture deterioration, soil erosion, and weed infestation that have beset it.

The protective, stabilising, and water-controlling combination of vigorous native vegetation, litter, and spongy soil has given way in many places to a shallow-rooted, less protective and, in fact, threadbare carpet of grass on compacted, less pervious, and often exhausted soils. The problem is how to restore an erosion-resistant and water-absorbent combination of soil and vegetation and at the same time to maintain and even to increase the production from our pastures.

To develop practical soil-conservation techniques as a solution to this problem the Soil Conservation and Rivers Control Council acquired soon after its establishment, eight typical deteriorated and eroded farms as soil-conservation reserves. Being typical hill country, these farms provided little scope for applying directly the array of well known soil-conservation practices developed in the United States for ploughable land. They did,

however, give ample opportunity to investigate various adaptations of the limited range of soil-conservation practices applicable to unploughable hill country and also modifications of normal farm-management methods. The experimental work was undertaken by soil-conservation officers of the Department of Agriculture. Additional experimental work was done on private farms, where the treatment of gully, slip, sheet, stream, and wind erosion was tackled directly by assisting farmers to do the necessary work to specified standards.

This early work on experimental and demonstration farms, together with the soil conservation works undertaken by catchment boards, yielded the following information and conclusions:

Spelling, or retirement from grazing, especially during flowering and seeding, revived both native and sown pastures remarkably and generally produced a cover on eroded land that resisted erosion and controlled water much better.

Surface sowing of clovers, and even grasses under some circumstances, resulted in the establishment of surprisingly good pastures on deteriorated sown and native grasslands, particularly when grazing was strictly controlled.

Topdressing with phosphate and trace elements proved to be the biggest factor in promoting the introduction of clovers and the strengthening of grasses on deteriorated hill-country soils.

Rotational grazing of cattle was more effective than sheep grazing in regenerating poor pastures, and cattle obviated the need to burn native pastures periodically. When burning and rabbits were eliminated the rapid recovery of native pastures under controlled cattle grazing was most promising.

The value of planted trees in healing unstable eroded land, particularly in gullies, was confirmed in all districts, as was the effectiveness of native cover regenerated by complete spelling in areas of higher rainfall.

Pasture furrows were valuable in conserving water and reducing the scour of soil.

Graded banks and broad-base terraces were strikingly effective in stopping the loss of soil from cultivated slopes by sheet and rill erosion and in greatly reducing uncontrolled run-off.

Wide, shallow, grassed waterways proved effective in harmlessly disposing of run-off that could not be retained on the land.

Dams capable of temporarily storing floodwaters and regulating their discharge through a pipe demonstrated their merits.

Gully-control works, such as debris dams, drops, and planting, proved effective; but it was found that they generally had to be supported by radical changes in the grazing management of the catchment and by such measures as topdressing, terracing, and the diversion of the water away from the gully.

It was found that all the other conservation practices were of limited use until topdressing and oversowing not only increased the protective value of the pasture but also increased the carrying capacity of the land and so provided revenue for other improvements and supporting conservation practices. However, topdressing and seeding are difficult and expensive on hill country. The economical solution was sought in the aerial mechanisation of this work. Fifteen years ago the Soil Conservation and Rivers Control Council began to organise and finance trials of aerial topdressing and seeding. They were so successful that the agricultural aviation industry was soon well established and has since grown phenomenally. Other work also done by the industry now includes poisoning rabbits and other vermin, dropping fencing materials in difficult country, and weed spraying. These are all used to help soil conservation, and aerial spraying is also used to kill willows when this is required for river-control works.

All these practices for reducing soil erosion have been incorporated in the policy of the Soil Conservation and Rivers Control Council. Another important measure the council promotes is the prevention and control of fire in hill country.

The planning of comprehensive soil-conservation measures in any area begins with a soil-conservation survey. This has the purpose of determining the best permanent use for each unit of land in relation to its own characteristics and the whole of the catchment in which it is situated, according to the limitations imposed on the land by the physical factors of slope, soil, erosion, and climate. Such a survey provides a scientific evaluation of the physical and farming factors that determine the best use of the land resources and the conservation treatment required in the interests of maximum permanent production and minimum soil erosion. These surveys are based on a system of land-capability classification with eight classes, four for land suitable for cultivation, three for land not suitable for cultivation but suitable for grazing or for forestry, and the eighth class for extremely rough, arid, or swampy land, suitable for neither forestry nor grazing but perhaps suitable for wildlife, watershed protection, or recreation.

Photo: Soil Conservation and Rivers Control Council (D. N. Bircham)

An aerial view of the upper Motueka River. On the right of the river, running close to the tip of the aeroplane's wing, is a line of trenched willows. These are a part of the works in hand to train the river, to prevent flooding and erosion of the valuable land alongside.

It is sometimes well worth while to undertake isolated soil-conservation works but it is preferred that, from the soil-conservation surveys, conservation farm plans should be formulated. The land-capability classes are recorded in practical detail on a map of the farm. The permanent future use of each unit of land is planned within the economy of the farm and appropriate conservation treatments are developed for each class of land in each new paddock. The plan is then discussed in detail with the farmer, and the implementing of the plan is staged over a period of years to suit his resources. According to the needs of the farm the plan finally adopted combines good farming and the special conservation practices required for the best permanent use of the land.

The goal of soil conservation is the application of conservation-farm plans on every farm in a catchment. Greater protection and control can be obtained from closely integrated schemes, and, further, instances of flooding and gullying and other deterioration often affect several farms. Farmers can do only a limited amount of effective control individually, but collectively they can achieve balanced control and full use of the soil and water resources of entire catchments. Conservation farm plans on farming land, supplemented by conservation forestry and other conservation measures on the unfarmed portions of catchments, provide a soil-conservation scheme, which, coordinated with river-control and drainage schemes in the lower parts of the catchment, achieves a complete catchment-control scheme.

Drainage and River Control

As with soil-conservation measures so, in the case of river and drainage works, it is often necessary to undertake isolated remedial jobs because of the urgency of correcting unsatisfactory conditions or preventing progressive damage. However, the broad purposes of such works and the means of achieving the desired ends are best understood by considering major control schemes covering extensive lengths of river valleys and including works both on the river itself and for the drainage of adjacent land.

The objects of major river-control schemes are firstly to stabilise the channel and increase its hydraulic efficiency, secondly to reduce the spillage of floodwaters, and thirdly to provide a better drainage outfall for land requiring it. The first object is achieved by training works to induce freshes and floods to do the necessary excavation, by bank protection, and by cut-offs. The second object is achieved to some extent by improved channel efficiency. In more elaborate schemes general stopbanking is required and, in some cases, part of the major floods may be diverted down floodways or ponded. Achievement of the third object depends usually on normal river levels being sufficiently low for gravity drainage of the adjacent country. When the land is capable of high development better water control is justified and drainage water may then be pumped during periods of high river flow. Before embarking on a large-scale scheme to attain these objects two other matters must be considered: one is the condition of the catchment and the soil-conservation measures required so that detritus will not overwhelm the river works downstream, and the other is the economic benefit that the scheme will confer.

The predominant use of training works is in the shingle reaches of a river for the purpose of producing a single-thread channel. In its shingle phase a river generally occupies a wide bed containing braided channels that are constantly changing, and the axis of the river is usually relatively straight. To produce a single-thread low-flow channel in such a river

requires the introduction of meandering, so that water depth, gradient, and the size of bed material are in balance. The works used to bring this about are the clearing of unwanted willows, the construction of groynes to direct the flow in the desired direction, and the blocking of undesirable channels. Works over long lengths of river need to be coordinated so that they are mutually supporting. They may then be of lighter construction than when only an isolated length of river is treated. When a single entrenched meandering channel has been achieved, much of the original wide bed can be reclaimed, first by planting with willows to encourage the deposition of material carried by the river and then, when the land has been built up to a satisfactory level, by clearing the willows and putting the land down in grass. Training and channel-stabilising works are also necessary in the silt phase of a river, to prevent the undesirable cutting-off of meanders and to develop bends of easy curvature. In these circumstances heavy rock is used extensively for bank protection, but anchored trees may be adequate where the attack is not severe provided the water is not too deep.

An appreciable reduction in the incidence of flooding is obtained through the development of a more effective channel by means of training works. Sometimes it is desirable to bring the natural river banks to a uniform gradient by small stopbanks across depressions. Additional protection against flooding can be provided only by continuous stopbanks. When the gradient in the lower reaches is flat the natural channel may be incapable of development to contain the design flood. Sometimes it is possible to correct the gradient by cutting a shorter channel to the sea. Alternatively, the flood flow in excess of what can be contained in the channel downstream may be diverted down a floodway or spilt into a natural ponding basin. In time, economic pressure may enforce the abandonment of this last method because the land in the ponding basin is usually highly fertile.

Natural flood plains usually fall away from the river; and there is a belt of wet land along the foot of the hills bordering the valley. The country also falls in the same direction as the river, and drainage from the wet land can be picked up by channels running roughly parallel to the river and discharging into it further downstream. There are two methods

Photo: Soil Conservation and Rivers Control Council (D. N. Bircham)

Accurate and detailed information about quantity and rate of flow of water is required before any water-engineering works are begun. To the right of the bridge is a structure housing a recorder that makes a continuous graph of the changes in the height of the river. (Rakaia Gorge.)

for preventing the blockage of drainage outfalls by stopbanks along the river. The smaller outfalls may be discharged through the stopbanks by means of culverts fitted with flapgates. When streams are too large to be passed through a culvert the stopbanks must be returned up the tributary to higher ground. During floods in the river the flapgates close and local water ponds behind the main stopbanks; when return stopbanks are used the water in the tributary rises to a level controlled by flood level in the main river. When land becomes highly developed better water control is necessary than can be provided by a gravity outfall alone and pumping stations must then be introduced. These should always incorporate a gravity outfall, which, by operating when the river is not in flood, reduces pumping to a minimum.

The Work Accomplished

The 21 years since the constitution of the Soil Conservation and Rivers Control Council have seen the establishment of 13 catchment boards and three catchment commissions, all operating under the general coordination of the council. Each of these administers a territory bounded by the watersheds between major river systems. During this period also the various Government departments concerned have greatly increased their activity in the fields of work that are the special concern of the council. Including the Waikato catchment, which is administered by a separate authority

constituted by a special Act, more than three-quarters of the area of New Zealand is now covered by catchment authorities with the particular responsibility of attending to soil conservation and river control.

Works of many kinds have been constructed in all parts of the country, and greater improvements have already been achieved in the condition of river channels, in the effectiveness of drainage in flood protection, and in the maintenance of our invaluable soil resources. At the same time the work has enabled great increases to be made in our primary production. The works carried out under the jurisdiction of the Soil Conservation and Rivers Control Council and the catchment authorities have cost in all about £24,000,000. Of this amount, about £16,000,000 has been contributed by the Government and administered through the council.

Two cover photos depict erosion and its results

For the benefit of young readers especially a few explanations of words used in the above article are appended—Ed.

Sheet erosion: the washing away of the top soil in thin sheets over a large area.

Biotic: having reference to all the forms of life of a district, their environments, and their influence on one another.

Ecology: the study of living things in relation to their environment.

Run-off: water that flows off the surface.

Training works: engineering devices that induce a river to act in a desired manner.

Spillage: spilling over (low-lying land).

Cut-off: a short channel across a bend in a river.

Braided channels are intertwined like the strands in a plait of hair; see illus. on page 8.

Meandering: winding, turning, as applied to a river channel.

Flapgates: gates that swing open only when water is being discharged.

Detritus: any loose material resulting from the disintegration of rock.

WORLD WILDLIFE FUND

The World Wildlife Fund has a tremendous job on its hands and it is making a world-wide appeal for funds to allow it to proceed with the many problems it has to deal with. We publish on this page two illustrations from a recent brochure indicating the type of work the Fund deals with. H.R.H. the Duke of Edinburgh, K.G., is president of the British appeal; the office is at 2 Caxton Street, Westminster, London, S.W.1.

Most of the other international bodies accept subscribing members. We shall be glad to supply the addresses of these bodies if requested.

Pollution of the Sea

This guillemot is waiting for death. It is covered with thick oil discharged on the sea by a ship. It cannot swim or fly and has swallowed a large amount of oil. Oil pollution is a world-wide problem, and through the efforts of the International Council for Bird Preservation the governments of the leading maritime countries have agreed to cooperate in taking steps to keep the seas clean. But much must be done before this cruel and wanton destruction of sea birds is ended.

Drought

A baby elephant digs in a dried-up river bed in a pathetic attempt to find water. In the Tsavo East National Park in Kenya 10,000 animals perished in the first half of 1961 in spite of the valiant efforts of the game wardens to save them. Alleviation of suffering of this kind can be achieved by building small dams or drilling waterholes, but in some places it may entail the costly laying of pipelines to rivers miles away.

KEAS AND SHEEP

For many years within New Zealand, and frequently in overseas journals, the New Zealand kea (*Nestor notabilis*) has been described in terms which can leave no doubt in the reader's mind that the bird is an implacable destroyer of sheep and these impressions still persist, notwithstanding that competent observers have concluded that the kea is a much maligned bird, albeit a mischievous one. It has been demonstrated that the policy of paying a bounty for the destruction of keas was entirely without justification and it was due largely to the efforts of our Society that the bounty was discontinued. By courtesy of the Ornithological Society of New Zealand we are reproducing an article by J. R. Jackson from the June 1962 issue of *Notornis*, the official journal of that society. Mr. Jackson is a competent observer and has obviously given much thought to the subject. We hope that publication of his article will place the kea problem in its proper perspective.

Photo of kea on front cover.

DO KEAS ATTACK SHEEP? by J. R. Jackson

For nearly a hundred years it has been widely believed among runholders and shepherds of the South Island high country that keas attack and kill sheep. Consequently during much of this period a bounty has been paid for keas. In 1886 the Government bounty was £1 and today many runholders pay about the same amount. After studying keas I have concluded this destruction is not justified.

The whole subject is part of the folklore of New Zealand. It has been collected by Benham (1906) and by Marriner (1906 and 1908) and today most of the tales told can be matched by what these authors put on record. One variant, not to be found in these authors, is described below.

The discovery of keas attacking sheep is lost in confusion. Marriner traced the first published account back to 1868 and attacks to 1867. I have been unable to check Marriner's 1868 and indeed Benham gives a different source for a newspaper article which Potts (1871) refers to a "local paper". Also Benham points out how two men on neighbouring stations, J. McDonald on Wanaka Station in 1867 and J. Campbell on West Wanaka Station in 1870 both claim to have first discovered keas attacking sheep. Beattie (1936, 1937 and 1938) mentions a third independent discovery. Possibly the dislike of the kea is older; perhaps it is a transmuted hatred of cockatoos brought to New Zealand by Australian shepherds, the "shagroons". Certainly Mr. D. A. Cameron, the original runholder of Nokomai and one of Marriner's correspondents, was from Australia, and Beattie (1936, 1937 and 1938) makes apparent the large Australian element among the early Otago and Southland settlers.

The year 1867 is of interest for, as Barker (1870) describes from 29 July to 6 August was the first heavy and persistent snowfall experienced by the runholders. Losses of sheep were very large. Yet in the early accounts as Potts (1871) no mention is made of keas feeding on carrion with which they were so well supplied in 1867. They are mentioned feeding at the gallows and a theory built on this basis. The heavy snowfall in August was followed in February 1868 by record floods (Brown 1940).

This account is largely an internal analysis of the folklore and it is my purpose to show:—

1. The accounts differ greatly;
2. Several accounts contain inaccurate descriptions. The authors may have had difficulty in describing what they saw but even so public policy should not be based on faulty accounts;
3. A geographic variation of account.

DIFFERENCES

A. Difficulty of Witnessing Attack

As Marriner points out when he began collecting evidence there were no first-hand descriptions of kea attack. He says he obtained thirty descriptions and it is possible by comparing his accounts and Benham's to identify twenty witnesses. Benham has ten descriptions, four in common with Marriner. Since 1906 this topic has been discussed in the newspapers every few years and usually one or two more witnesses write their descriptions. It is notable that there have been few witnesses; yet four

of Mariner's twenty and five of Benham's ten witnesses claimed to have seen kea attack two or more times. Typical is J. Sutherland of Benmore (Marriner 1906) who claimed "on several occasions I saw them attack sheep."

Also a common tale is of scoffing shearers being convinced by a runholder who knew where to ride to get a sheep killed the previous night.

B. The Loss of Sheep caused by Keas

Most observers believe that one or two sheep are killed at a time and perhaps a dozen in a season. Like R. McKenzie, Birchwood Station (Benham) they regard large losses as "gross exaggerations". He says, "On one occasion, during a snow storm, when two or three hundred sheep had been hemmed in for a few days, I found three or four sheep killed. . . ."

On the other hand, A. Watherson, of Rees Valley Station (Marriner 1908) describes how a flock of 40 keas killed 38 wethers from a camp of 300 to 400 sheep overnight. Wathers-ton also claimed 700 sheep were lost from a flock of 1300 during a summer; and E. Cameron (Benham) tells how 200 from 400 were lost in winter up the Matukituki Valley.

Cautiously Marriner (1908) reckons that overall "5 per cent. would well cover the annual loss due to keas". It is interesting to compare this estimate with some figures given by Clarke (1960). Clarke found that prior to 1950 annual losses on Mount Hay Station, McKenzie Country, were 12 per cent. This was reduced to 4 per cent. by various improvements. He records that on Mt. Cook Station winter snow losses were 2 per cent.

Now it is possible to estimate the severity of kea attack and the evidence shows the rate must be very low. This bird normally feeds on nectar, berries, grubs and beetles, roots and buds. It has learnt to recognise carrion as food and, it is alleged, became a predator, preying on an animal much larger than itself, all within the last 100 years. It would be expected to be an inefficient predator. It would make many more unsuccessful attacks than successful. These unsuccessful attacks would more or less severely wound the sheep. There are several descriptions of wounded sheep being found on the run and scarred sheep being noticed at shearing. They were noticed at shearing in 1867 on Wanaka Station, but as Benham describes by 1906 they were seldom noticed for the character of attack had changed. Today few men with a lifetime experience would claim to have seen at shearing more than a dozen sheep bearing healed kea wounds. Perhaps the rate is one sheep that has severe kea wounds in 20,000 shorn.

For a year I worked in G. L. Bowron and Co. Ltd.'s tannery and we handled many sheep pelts. During the year nearly 2000 dozen sheep skins of all grades from Canterbury and Otago were tanned and if we use the fraction 1/10 (given me by the Canterbury Frozen Meat Co. Ltd. 1959) as the ratio of high country to low country sheep killed, then approximately 2000 high country sheep were tanned. None of these bore scars which we would attribute to kea attack. Further, the grader, Mr. J. O'Neill, who had been grading for 10 years previously, during which time he would have inspected between 20,000 and 40,000 high country pelts, was confident that none bore scars from kea attack.

Killer Keas

In North Canterbury, where it is usually claimed that only a few sheep are lost at a time, this is considered to be the work of a "killer kea". When he is in a flock he will kill the sheep and the other keas join in feeding on the dead sheep. He is usually found to be an adult male and when he is destroyed there is no further loss of sheep.

The large losses cannot be the work of a few keas, nor can the theory of killer keas explain the rapid spread of the habit of attacking sheep. If reports are to be believed, in a few years every station along the length of the Southern Alps from Marlborough to Southland, had experience of keas killing sheep and has continued to. Every small, remote valley has and has had its killers. This points to learning by keas, as would be expected in such an intelligent bird.

Blood Poisoning

If the low rate of injury, less than 1/20,000, is conceded, then either keas attack few sheep, or most sheep attacked die. The latter is sometimes explained by "blood poisoning". By one variant the death of sheep with small wounds, perhaps a quarter-inch tear of the skin, is explained. Not infrequently these sheep with small wounds are found dead among other sheep more typically "kea-ed", that is among sheep with their body cavity

open. I found an instance, 4 January, 1958, after a prolonged spell of very bad weather. In a small bay at the bush-edge were two sheep, both only a few days dead, and with frothing of blood from the nostrils. One was a typical "kea-ed" sheep, whereas the other had no wound that I could find. The frothing of blood indicates a haemorrhage, perhaps the result of an infection like gas-gangrene. If so, on occasion keas might carry the infection after feeding on carrion, but also sheep would be expected to be infected more often naturally. In other cases of poisoning there are extensive areas blackened under the skin on the back. This blackening may be bruising and subsequent gangrene, and in J. H. King's description (Marriner 1906) "bruising" is used. Unfortunately I have seen no such sheep.

It seemed worth looking to find a pathogen. Prof. J. A. R. Miles, of Otago University, has helped. He has looked especially for psittacosis and haematozoa, but failed to find them. Eighteen keas have been examined at the Otago Medical School and blood samples from another ten also. Laird (1949) reports his examination of three blood smears and I have examined 32 smears. All the results have been negative. It has been found that some keas have a haemolytic anaemia. This is a stress disease and there seem to be no associated microbes. Some keas have bumble-foot, almost certainly as in poultry and many other vertebrates, a staphylococcal infection. These would not be the poison. Further I have handled more than 500 different keas and have been occasionally scratched and bitten, but not poisoned. Therefore if keas do carry a poison only a small proportion can be carriers and few sheep receive a poison from keas.

An ideal way to tackle this problem of blood-poisoning would be to send live poisoned sheep to Otago University for expert examination, so that the organism responsible could be found. Then it might be worth looking further to find the organism on keas.

One point does arise: if the small wounds heal, and if small wounds are usual, then the rates of attack may be greater than the above estimates.

Inaccurate Description

Many accounts reveal that the authors have not watched keas carefully. While kea is the subject, the description is of attack by man or a mammalian predator, not by that fastidious bird, the kea.

Keas Covered in Blood

Several times I have had described to me keas covered in blood, their chest and head covered in gore. A simple experiment is to smear some blood on a kea. On 12 August, 1961, I chose the kea L1218, a first-year male, the boss of about a dozen juveniles about. The first difficulty was in wetting the plumage, for the blood tended to roll off. It was necessary to rub the blood into the plumage as I did on the crown, chest and a leg. He flew 25 yards away, fluffed up his feathers and spent five minutes preening, but made little impression on the blood. Then he began walking back for more food. As he walked past another kea, they stopped and it preened the blood on his crown for a minute. Then he came back by me and fed. For the next hour, while I watched, his feathers remained fluffed up and he was uneasy. Next morning his plumage was clean, his manner normal, and again he was boss.

Yet by careful observation keas when feeding on carrion will be seen with blood on part of their plumage, on the small feathers at the base of the upper mandible. They have got it on when the mandible has been driven into carrion up to the hilt. Similarly when feeding on roots often a little mud gets on these feathers.

They do not get covered in gore like an inexperienced butcher.

The Kea's Feeding

R. Guthrie, of Burke's Pass (Marriner 1908), describes the kea as "viciously striking" and many others similarly. The kea is careful and slow in the use of its bill, though a big pressure is exerted as it closes. It will wriggle and heave its body to drive the upper mandible slowly in and then lever. Never does it strike viciously and repeatedly and quickly.

A kea is loath to feed in small corners or where its view is blocked. Their vision with eyes on the side, and directed slightly down is far wider than ours, so while feeding they can see your movements out of the corner of their eyes. A local variant told by H. Heckler, Lumsden (Marriner 1908), and still common there, is how keas so engrossed in feeding on carrion are easily hit and killed with a stick. The keas would flush at the preparatory backswing.

Keas' Nocturnal Activity

Another common error is to emphasise the darkness of the night when attack occurs. Normally a kea goes to roost half an hour or so before nightfall, but if they have found rich feeding they may continue after dark. Their night vision is not as good as man's. After dark they will be seen misjudging their landing on a branch. I have been able to see baits from six feet which keas failed to see from three inches. They will continue feeding after dark on a sheep corpse but as night becomes blacker the adults will slip away to their usual roosts. The juveniles may roost nearby. If keas have not come up to you before nightfall they will not come after. They may wake and feed actively an hour or so before daybreak by a full moon. After daybreak and before sunrise and again after sunset and before nightfall keas feed on the open riverbeds. With the rise of the sun they retreat to the forest.

Keas Grimly Hanging On To Frantic Sheep

Many accounts are like R. McKenzie's, Birchwood (Marriner 1906) who describes the kea ignoring the sheep's frantic efforts to rid itself of the bird. He writes: "The frenzied sheep jumped and ran about in any direction for dear life, then, separating itself from the mob, made a direct line down a steep slope and in its mad career finally dropped over a precipice, until which moment the bird held on with its claws, its wings slightly extended as if to steady itself or to be ready to fly off at any moment."

Actually the spread wings would not help the take-off, which begins with a low body, a swing forward and a spring, when the wings are raised.

More credible is J. Morgan's, Mesopotamia (Marriner 1906), description: "Then it inserted its beak; at this the sheep ran into the mob, and the kea just flew off, and when the sheep was quiet again it once more got on to its back. . . ."

I find it easy to entice keas on to my body, but at any movement they take flight.

I would judge eight of the fourteen accounts in Marriner (1908) as containing false statements.

Geographic Variation

Despite the mobile human population of New Zealand, I believe a geographic variation in the type of tale has developed.

In North Canterbury, from the Waimakariri Valley north, many will describe the kea sitting on a sheep's back. The sheep is often undisturbed and the kea apparently inactive, or pulling tufts of wool until flushed by the approach of a man. Here the runholder often tells how: "When I took over, the place was over-run with keas. In two or three years I had cleaned them up and have had no trouble since. I do not bother to destroy them now as I have got rid of the killer keas." It is here that killer keas are emphasised.

In Mid-Canterbury by the Rakaia and Rangitata Rivers run-holders complain of large losses and most actively destroy keas. The keas seem to attack at all seasons. Local tales still told are of a kea riding a sheep into the shearing shed and a sheep with a kea on its back trying to brush the kea off by running under a rock.

In the McKenzie Country there is more emphasis on attack in winter and spring snow falls. Here the frightened sheep often run over bluffs and in fact in the steeper mountain parts many sheep are lost over bluffs but in most keas are not incriminated.

In Otago and Southland by the lakes where keas were discovered attacking sheep, the largest losses are claimed like those described above. Even fifteen years ago, before the destruction of the rabbits, some runholders would claim to be considering giving up their runs because of kea losses, and rumours continued about actually giving up runs, despite Marriner's (1908) scotching one such rumour.

As described above by Lumsden, the tale of hitting keas for a six with the shepherd's crutch persists.

Positive Evidence Of The Kea As A Predator

Now keas do feed on carrion, and about the bush edge on most stations there is a good supply of this food. In an acre on the Bruce Spur, 11th October, 1958, I found eight dead sheep from the previous summer. Three in the bush had certainly not been "kea-ed". Of the five in the open, the keas fed on one and the others had not been investigated recently.

Also keas will attack live prey. Mr. R. Gillet, of Lincoln, had a tame kea which would catch and disembowel any mice thrown in its cage. Mr. A. G. MacIntyre, formerly a trapper at Wainihinihi, found a kea on a branch above a trapped opossum with its entrails pulled out. Besides being sick with the shock of trapping, the opossum was cold, wet and hungry when the kea found it and presumably attacked.

I have seen a juvenile kea pursue a blackbird (*T. merula*). On 2nd April, 1961, there was a flock of 50 juvenile keas on an avalanche fan at the foot of Mt. Oates. The ground was very broken with big blocks of rock, brought down by the winter avalanches surrounded by a thick alpine scrub. A male blackbird flushed and a kea chased it 200 yards across the fan for two or three minutes until both were lost from my sight. The blackbird would swerve round the boulders and shrubs, climb sharply 20 ft. and plunge down. The kea easily followed every manoeuvre. While this one kea chased the blackbird, the other keas were quite indifferent. This kea, perhaps recently fledged, may have made a mistake and thought he was playing in flight as with his parents.

It is not difficult to encourage a kea to sample a man. Once on a man they soon start investigating and tearing his clothes. Then the keas probe the flesh and the inevitable flinch causes the keas to take flight.

Conclusion

It is credible that keas do attack sheep trapped in snow, sick sheep, sheep injured by falls or sheep they mistake as dead. When such a sheep reacted they would take flight, but return when it relaxed. If such occurs, the evidence suggests it must be very rarely; so rarely, that the destruction of keas is not justified. This destruction, or the clearing of the forest, has made keas much less common in the runland than in the forest alps further west.

I consider that the protection which most native birds enjoy should be extended to keas.

Thanks

I wish to thank G. L. Bowron & Co. Ltd., Canterbury Frozen Meat Co. Ltd., Mr. J. O'Neill, and many shepherds and runholders, often unknown to me, who have told me of keas and their experiences.

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Dunedin Branch :

Outing to Taieri River

On 17 November last a launch trip down the Taieri River from Henley was taken by members of the Society. The scenery was very attractive. Although the hills along one bank of the river were covered mainly with manuka scrub, the other side was flanked first by farm land and farther down by an area of beautiful mixed native bush coming down to the water's edge. There were many cabbage trees, then in flower. It appeared that most of the district had in the past been swept by fire, which had destroyed much of the original bush, but the portion which remained had now been made a reserve. Those present heard with interest tales of early settlers along the river and stories of Maori exploits and legends connected with various features of the landscape.

Birds seen along the river and on some small islands in the stream included a number of white-faced herons, pukekos, pied stilts, ducks (including paradise ducks), red-billed and black-backed gulls, pipits, and harrier hawks. Two kingfishers' nests side by side (holes in the river bank) were seen but the birds did not appear. A clump of trees where seven white-faced herons nested was also pointed out.

PUKEKO

Our August leading article has drawn reports from observers in many parts of New Zealand, very briefly summarised in the following as fairly as possible.

Canterbury. Several correspondents deplore the disappearance of the pukeko or a heavy reduction in its populations over recent years.

Manawatu. Now rare in many parts. It is possible to travel 50-60 miles without seeing one.

Hastings. Counts taken in one area each year for four years were as follows: 1957, 37; 1960, 23; 1961, 14; 1962, 7.

Kaitaia. Quite plentiful 30 years ago, now rarely seen. Writer admits that on occasions when land was cultivated near raupo swamps the birds could be destructive if their populations were high. Nevertheless he finds it distressing to compare bird populations of 50 years ago with those of today.

West Coast (Rotokohu). Still plentiful near swampy areas. No fear of extermination there as they are not popular table birds; seldom shot unless they damage crops, which they can do. (Writer is most emphatic that paradise ducks should be totally protected in his area.)

Reefton. Fairly well established; shooters not really interested in them; few now shot. (Paradise ducks not strongly established but there are flocks. The writer understands they are strongly established in the Maruia Valley).

Cheviot. Up to five years ago there were plenty of pukeko, now none to be seen. Writer offers to contribute funds towards any effort to obtain complete protection.

Waipukurau. Fairly numerous; people don't go in for killing them much. Writer had on one occasion seen a pukeko despoil a duck's nest.

Mauriceville-Alfredton. Ten years ago pukeko were common; now much reduced mainly because of suitable habitat disappearing. Writer adds that they are just holding their own at the Hokowhitu lagoon, Palmerston North.

Raetihi. Correspondent on farm with eight dams or dew ponds of recent origin. No pukeko ever seen there now. (Paradise duck on increase; up to 10 seen at a time in a 20-acre paddock; no visible damage done by them. Four ponds always have young ducks on them).

Opotiki. One correspondent writes that pukeko were once plentiful but are now rarely seen. (About a dozen paradise ducks known). Another correspondent says that at Waiotahi Valley pukeko are still plentiful where land has not been cleared or drained. Some damage is recorded to maize and tomatoes.

Dannevirke. Waitahora valley: 50-60 pukekos present and holding their own. Kaitoki Lake Reserve: No shooting; 20-30 pukeko holding their own. Tiratu: A number still present. *Okarae:* There were pukeko years ago, but never seen now. Our Dannevirke Section considers that pukeko are steadily decreasing, and members consider it is time the bird had a spell.

Our correspondents are in general agreement on important points. As Guthrie Smith said, pukeko can be a trial round the kitchen garden or on cultivated plots. It is necessary therefore for farmers to have permission to deal with birds causing them trouble. Elsewhere the bird is greatly admired, an entertaining, beautiful creature now much reduced in numbers in some areas and apparently extinct in others. This is partly because of shooting but undoubtedly the loss of natural habitat also is a potent factor in the decreases. Many of our correspondents consider it wrong for this fine bird to be persecuted by shooters, especially in areas where their numbers are now low. One correspondent, a well known Bay of Plenty observer, puts it in the following terms: "I don't see why, at this date, so-called sportsmen should be entitled to perpetuate a primitive hunting instinct derived from savage humanity. An element of sadism is present and this makes the thing still more barbarous." With regard to the charge that pukeko rob duck's nests, this is summed up by one correspondent who says "someone should point out to these people that before they and their band of predators arrived in this fair land nature had achieved a harmonious balance with pukeko and grey duck in large numbers." Surely if anyone has

done injury to the grey duck it is those responsible for the introduction of the mallard."

We welcome the decision of the Wellington Acclimatisation Society, as reported in the press, to recommend that pukeko be removed from the shooting list next season. This is a very proper decision and a step in the right direction.

The Migration of Birds, by Jean Dorst. London, William Heinemann, 1962. xix, 476p., maps, bibliog. N.Z. price, 50s.

The fly-leaf information describes this book as the most comprehensive study of bird migration ever published, and states that in its approach and documentation it is likely to appeal as much to amateur ornithologists as to readers expert in the field. I doubt very much whether the general reader or lay nature lover will agree since, in my opinion, this is more a textbook for the serious student and must prove "heavy going" to others.

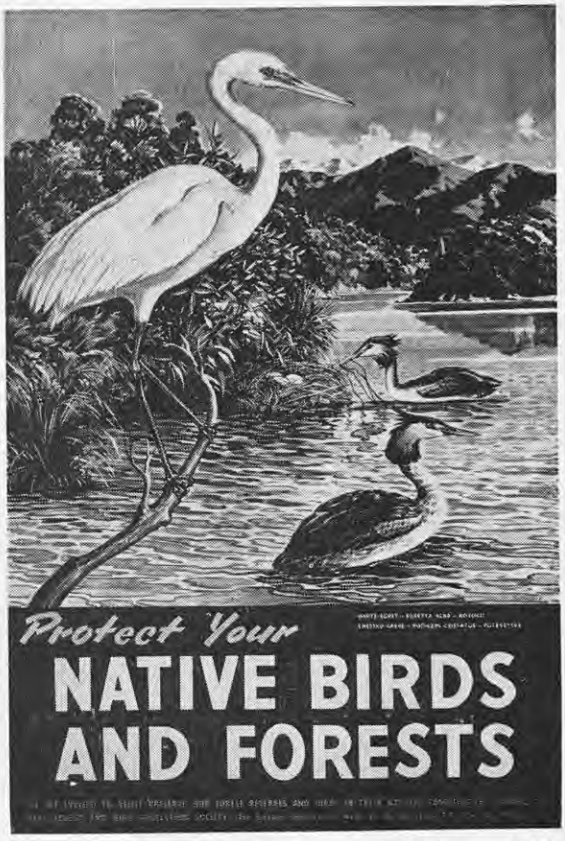
Dr. Jean Dorst is a director of the French Natural History Musem, and in this survey he covers the subject from the early theories on migration to be found in the Bible and in the works of Aristotle, up to the results of present-day research. He gives a completely new view of the reasons for migration and the different forms it takes; this has been evolved through the co-operation of bird stations all over the world, and the introduction of new and scientific methods—from ringing to radar—has offered results more nearly conclusive than the mixture of myth and imagination which formerly shrouded the subject.

After dealing with old explanations of bird migrations the author develops his work by proceeding through methods of studying this phenomenon and its occurrence in both hemispheres and in different regions. There are chapters on hibernation, invasions, the physiological stimulus which triggers off migration, and the orientation of migratory birds, concluding with a discourse on the origin and evolution of migration.

That part of the book which deals with New Zealand will be found in Chapter 5, "Migrations in the Southern Hemisphere," pp. 148-154, although the principal emphasis is on the more insular species. By way of comparison Australia receives only four pages of text in the same chapter but, of course, examples from both countries are given in other places, e.g., "Sea-bird Migrations", Chapter 7.

Since the dawn of history man has been fascinated by the disappearance and return of birds, and has invented countless legends and theories to account for them. In the past fifty years significant strides have been made towards solving these mysteries; but what we have learned about orientation, the physiology of the migratory impulse, and the fundamental causes of migration, are still, as the author puts it, "like a few guide posts planted in an almost virgin forest." Dr. Dorst's book at least brings the picture up to date.

The excellent charts and diagrams, and the very full bibliography makes this a valuable book of reference, at least to the serious student of ornithology. —J.H.S.



This magnificent coloured poster will be available next month. It depicts the white heron and the crested grebe.

PRELIMINARY NOTICE

NORTH ISLAND CAMP

Wednesday, 8 January, 1964, to
Tuesday, 14 January, 1964,
at New Plymouth Racecourse.

Camp opens with evening meeting at 8 p.m. and concludes with the evening meeting on 14 January, members dispersing next day. Good accommodation and all facilities, but limited to 60. In addition, an unlimited number of ideal caravan and tent sites available in natural grassed amphitheatre surrounded by native bush. Motel and hotel accommodation by arrangement.

A. F. Barwell,
31 Junction Road, Camp Organiser.
New Plymouth.

RED-DEER MENACE IN N.Z.

In a broadcast interview on 24 January, Dr. Wodzicki, Director of the Ecological Section of the D.S.I.R., spoke on New Zealand's problem. For nowhere else in the world, he said, were there comparable numbers of introduced animals within an environment of comparable vegetation. During his recent overseas tour, he had observed damage in the deer forests of Europe, but this vegetation could be restored, because it had developed *in the presence* of the browsing animals. In New Zealand this was not the case. Our unique vegetation had evolved without such species, and was thus particularly vulnerable to their inroads. Furthermore, the European trees were deciduous, which meant that the period during which browsing animals could damage their foliage was limited to a definite season, giving time also for recovery in the off season.

But there could be no such respite for New Zealand's indigenous vegetation. Here it was open season for browsing animals all the year round, the ample, never-ceasing food supply in its turn allowing numbers to multiply at a fantastic rate in a sort of vicious circle. And it had to be remembered that there were no predators.

Dr. Wodzicki next spoke of research as a major requirement for coping with our own peculiar deer problem, and he touched on the various types of research that are at present under way in different parts of the world on this topic at the present time, from Scottish ecological studies to the California research department. A Utah professor was engaged on a study of particular interest to New Zealand; for some areas carried both deer and sheep, a condition also existing in New Zealand. A point emphasised by Dr. Wodzicki was that New Zealand had not only *different* but also *many more* problems than other deer-carrying countries, and it was just not possible to make blanket assertions or generalise from findings in other countries. Local research was the answer, and this was in its initial stages in New Zealand. What was needed, summed up Dr. Wodzicki, was "cooperation, cooperation not only of Government departments and foresters, but also of sportsmen, landowners," and all who had the future welfare of the country at heart.

—From *Forestry News*, Feb. 1963.

THE CULTIVATION OF NATIVE PLANTS by Rev. Father C. J. Callaghan, S.M.

This talk was given to the Royal Forest and Bird Protection Society, Hastings-Havelock North Section by Rev. Father C. J. Callaghan, S.M., on 12 July, 1962.

Why grow native plants? Why grow anything? For the pleasure of it. And it is a noble pleasure, exclusively human. The pleasure we take in contemplating beauty is an aesthetic one, and it is the more satisfying if our efforts have contributed to it. Animals do not adorn the surroundings of their lairs; and it is a saddening sight when human beings neglect the grounds, large or small, of their homes. So we have our beds or borders of flowers and shrubs. But it is not just gardening that I wish to tell you about. For one thing, I am not a gardening expert, but my hobby is the study of our native plants. I have found it helps and enriches the pleasure of that hobby to identify the plants, and it helps far more to cultivate them.

God prepared the earth as our home, and He planted it with a great variety of gardens. These are the flora of the different lands. To make our gardens we borrow from His. We domesticate and improve the wild species. The plants in our nurseries and our gardens are drawn from all over the world. I think it is a pity that quite often there is little or nothing from our own flora.

By contrast, my own interest is narrow. I grow only native plants. It is an expression of my love for our own land, its flora in particular. Kipling tells us:

> God gave all men all earth to love, but since our hearts are small,
> Ordained one land should prove beloved over all.

What to Grow

Some of the trees, if there is room. But there is no need to plan as if they were to remain there for ever, or to come to full maturity. The stage of our trees up to early maturity is often the most ornamental. A tree fully justifies itself if it gives pleasure to a generation or two. Besides, some may be topped or pruned to advantage—red beech, for instance; it may then be pruned regularly for decoration purposes. Many native trees, till

mature, are economical of space: kauri, rewarewa, hinau, lacebarks, above all, lancewood.

How to Grow Them

Even if nursery plants, they may require partial shade and shelter. Most will do well in company, in a plantation (the bush plants); but nurseries can provide good specimen trees.

Some are plants of the open: coprosmas, lacebarks, kowhai, karaka, akeake, pittosporums, manuka, kumarahou, myrtles, rangiora, olearias, senecios, brooms.

If plants are taken from the wild state they need a period in a home nursery (a) to acclimatise, (b) to develop a root system. They would probably do best if grown for a period in pots.

It is no advantage to take soil with small plants (Cockayne). Many can be grown from cuttings: most shrubs, some trees. Seeds are to be had in abundance in season; worth trying.

My own object was simply to make a collection, as large as possible. I have found that most grow readily (some with shade and frost protection) if not allowed to dry out before becoming well rooted.

List of plants to select from: (H., hardy; V.H., very hardy; H.H., half hardy).

TREES: Kauri H.; Putaputaweta V.H.; Titoki H.; Rimu V.H.; *Dacrydium kirkii* (monoao) H.H.; *Dracophyllum* H.H.; Kowhai V.H.; *Fuchsia* (*excorticata, procumbens, colensoi*) V.H.; *Hoheria* (*sexstylosa, populnea*) V.H.; *Gaya lyallii* (mountain ribbonwood) V.H.; Broadleaf (*Griselinea littoralis* and *lucida*) V.H.; Pigeonwood (*Hedycarya arborea*) H.; Kumarahou (*Pomaderris elliptica*) H.H.; Tawari (*Ixerba brexioides*) H.; Wharangi (*Melicope ternata*) H.H.; *Melicytus lanceolatus,* V.H.; Manuka species (*nicholsii*) V.H.; Kaikawaka or Pahautea (*Libocedrus* spp.) V.H.; Rata trees (*robusta* H.H., *lucida* V.H., *excelsa* H.H.); Beech (red, silver, black) V.H.; Five-finger V.H.; *Neopanax edgerleyi* (raukawa) V.H.; Maire (black, white, mountain) H.H.; Celery pine (*Phyllocladus*), tanekaha H.H.; Toatoa H.H.; Mountain Toatoa V.H.; *Pittosporum* (kohuhu V.H., tarata V.H., *dallii* V.H.); Pseudopanax (lancewood V.H.; *lessonii* H.H., *trifoliatum* H.H., *discolor* H.); *Quintinia acutifolia* V.H.; Nikau H.H.; Puriri H.H.; Pukatea H.H.; *Ascarina lucida* H.; Tawa H.H.; Taraire H.H.; Karaka H.H.; Kohekohe H.H.; Hinau V.H.; Pokaka V.H.; Rewarewa H.H.; Mangeao (*Litsea calicaris*) H.H.; Puka (*Meryta sinclairii*) H.H.; Ngaio H.; *Neopanax laetum* H.H.; Kaikomako V.H.; *Persoonia toru* H.; *Plagianthus betulinus* V.H.; *Myrsine australis* (hapau) V.H.; Toro H.H.; Pate (*Schefflera digitata*) H.; Akeake (2) (*Dodonaea viscosa, purpurea*) H.; Rangiora (bronze) H.H.; Broom (*Carmichaelia odorata, australis, repens, acerosa*) H.H.; Corokia (*buddleioides* H.H., *cotoneaster* V.H.); *Cyathodes acerosa eioides* H.H., *cotoneaster* V.H.); *Cyathodes acerosa* drupes white, red) V.H.

NEW ZEALAND BIRDS AND FLOWERS; a selection of colour plates 32 pp., 49 plates and coloured cover; 9½ x 7¼ inches; price 7s. 6d. Wellington: A. H. & A. W. Reed.

This is an excellent production, a great credit to both publishers and printers. It fills a gap in the many books on our birds and flowers by providing a representative selection at a price within everyone's reach.

A noteworthy feature of the book is that the birds photographed are not stuffed specimens from a museum but real live birds. Scientific names of birds and plants as well as popular ones are given. Each plate is accompanied by a few lines of descriptive text.

Some will say that in one or two places the colour is not true to nature, but the only place where there is a noticeable deviation is in the colour of the kaka. Perhaps a justifiable criticism—and the only one of any consequence—is that a reader not familiar with the relative sizes of the birds will not know, for instance, whether the kiwi is bigger or smaller than the tui, or whether the flowers of the hoheria are bigger than those of the clematis. As there is certain to be a second printing of this book perhaps the publishers will be able to indicate sizes and also to tidy up the register in those very few places where slight mis-register detracts from the beauty of the plates.

THE JUNIOR SECTION AND THE J. R. McKENZIE TRUST

The Junior Section is largely financed by an annual grant of £150 made by the J. R. McKenzie Trust Board. Readers of these pages will be interested to learn that the total distribution to date by the Trust is £326,900. The income of the Trust is mainly derived from shares in McKenzies (NZ) Ltd., 30 per cent. of the profits of McKenzie stores going back to the community through the generous trusts established by the late Sir John McKenzie.

Another Forest Park?

The following has been extracted from a letter written to Mr. Northcote Bade by Mr. Frank Soper of Puramahoe, Takaka.

The Minister of Lands and Forests is considering declaring the whole area dealt with in the narrative a National Forest Park, and Mr. Soper's remarks will indicate the wisdom of doing so before more of that unique area is lost for ever.

I did a traverse of the Snowdon and Douglas Ranges as follows. First day, up the old goldmining trail on the Kill Devil from near upper Takaka to the forks of the Waingaro and Stanley; two hours walking and wading up the Stanley to our first camp. Next morning up the Big Slip, a gigantic rock fall which blocked the river and created a lake over a mile long (which was once Wattie's run, now Wattie's lake). This climb of 2¾ hours set us on the Snowdon range at 5,000ft. and better with magnificent views and a fascination of flora, *Ranunculus* (about five species), ourisias, *Haastia, Drapetes,* aciphyllas—the lot! Too early for most of the celmisias but huge rosettes of *C. traversii, C. dallii, C. monroi,* and *C. petriei. Celmisia petriei* is the Botany Division's verdice on the *pseudo-serrata* from Boulder. I'm not quite convinced yet. There are some tough ridges to negotiate from Snowdon to Douglas; it is not tourist country, and in fact I don't know of anybody's having done the complete trip. Max and I (a day overdue from a bad patch of weather) gained Anatoki Peak on the fourth day. Here going is perilous, and we encountered finally a sheer cliff over 100ft. high running from the crest of the range down to the river below. Given time we might have found our way down, for we wanted to reach Boulder Lake. However, we turned down off the mountain to camp that night at the Anatoki River forks and so home. O, Boy! A reasonably abundant bird life—paradise ducks and young on the Stanley, a family of teal on a little lonely lake at the head of the Burgoo, and blue duck plentiful in the Anatoki; deer in velvet, and wild pigs, at Kill Devil and Anatoki, also goats in the latter, and all over the highest tops, if you please, hares!

It's a wonderful, wonderful, country but you need to be fit and it helps if you're lucky.

The Brown Cow sidling is a four-lane highway in comparison and so to business.

Michael, whom you will remember from your first trip, flew over the area this past weekend, 1st Dec., and checked on the fire, which began in the Clark at a fork which is formed by a tributary and which encloses a triangle of tussock-covered flat. A camp fire was simply lit too near the tussock and the whole thing literally exploded. Mike reports "many ridges of native forest stripped up to 4,000ft. One tongue of flames almost made the Clarke-Aorere divide." This would have been devastation plus, for all the tussock land of Olympus would have been stripped bare. The fire worked up the slopes of the peak south-west of Goreen Saddle, and one ridge of burnt secondary growth is completely isolated from the main fire. A screaming gale, still blowing when we crossed the Cow at midnight in fog and rain, simply swept the flames across the intervening gullies, which in many cases were not burned out. Mike says that much of the vegetation of the eastern side of the valley was secondary growth rata (southern) and reckons that a number of kiwis and fernbirds would have been killed.

Apart from the above fire, which was an accident, though due to carelessness, we have our normal quota of spring fires. Some thousand or so acres of manuka, fern, secondary growth, and bush have gone from the foothills. South-west of Takaka a six-mile strip all the way from the Aorere River near Barnham into the Quartz Ranges has been blackened, and here you can write off a few fernbirds. Behind Puramahoi a spur running into the bush is still smouldering after a second fire in a few weeks.

That is the tragedy of this area. A botanists' paradise may be hackney stuff but if you had been with me on Snowdon and Douglas we wouldn't be home yet! I sent specimens to the Botany Division and should have sent boxes more.

(Continued from page 23)

was a weasel chasing a rat in full view of several men, the rat taking to a tree. The weasel followed till the rat was edged along the branch to the thin end, when it fell to the ground and was stunned. Before it could recover, the weasel was down the tree, and had grabbed the rat, which was bigger than itself, and struggling made off, dragging the rat along. The rat started to squeal while on the branch just before it fell off.

Extract from an Honorary Ranger's Report

In the Mt. Roskill area starlings and minahs seem to thrive and live in harmony, both species increasing about 100 per cent. last year. When the starlings occupy the lawns the minahs leave and vice versa.

At Whangaparaoa the quail, both Australian and Californian, seem to have been greatly reduced this season and very few are now seen, but the heavy building going on here would partly account for this. There are still quite a number of pheasants around, a few rabbits and opossums, and I have seen an occasional stoat in this area. Of other birds we have the white-backed crow, tuis, moreporks, and all the usual small native birds including a few pair of parrakeets and the usual shore and sea birds, bittern, shags, and all the gulls.

At Waiwera an occasional Australian white cockatoo puts in an appearance; also there are quite a number of pukekos between Orewa and Waiwera. There were fledgling thrushes here the second week in August but, except for a few blackbirds, most birds did not begin to nest till September. A sight to see here is the homing of starlings. I counted 23 flocks with several hundred in each passing over my house, besides quite a number of straggler groups with a few dozen in each during the course of half an hour. They roost in the pine plantation at the tip of the peninsula and must travel several miles to their feeding grounds. There are still quite a number about in spite of the fact that many of them are nesting.

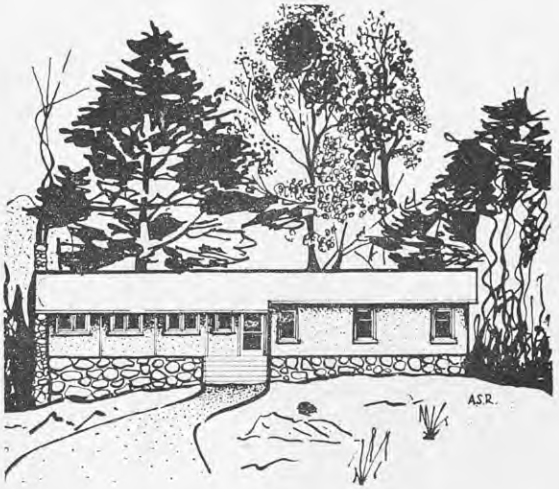
I saw a kingfisher make a dive attack on a young thrush on my section but the mother drove after it in no uncertain manner. The thrush could not fly properly but this is the first time I have seen a kingfisher attack a young bird. I have seen them take frogs and mice.

An amusing incident which I witnessed in the Morrinsville area was a pukeko charging after a stoat. Presumably the stoat was in the vicinity of a nest and the pukeko was able to land quite a few good pecks at the rear end of the stoat and must have chased it several hundred yards. The stoat was going all out. Another incident

(Continued at foot of page 22)

RUAPEHU LODGE

FURTHER NOTES



There comes a time in most enterprises, usually about half way, when the going itself becomes a preoccupation and the outcome is a thought too far off—a time of plodding. (Remember those days, we say later on, how it rained.)

Since last Journal issue our funds have increased to £1,800. Thus we are still moving ahead, but—too slowly. In addition to our continuing appeal to members for contributions, either as loans or outright gifts, we are making application for a substantial grant from funds administered by our Council.

Meanwhile members of the Lodge Committee have again visited Ruapehu. Mr. Mazey, the chief ranger, accompanied us in a survey of the building areas. The whole aspect is entrancing, with a beech forest on the left, a sparkling and busy little creek down on the right, and beyond it further bush. Up the valley looms the bulk of upper Ruapehu while down below are the plains, across to the blunt wedge of Hikurangi.

The site itself is a scrubby gentle slope with little alpine gardens already planted about for us by nature. Behind the bush on the left will go a substantial drain, Mr. Mazey informs us, to capture any seepage and deflect rain water. We examined the sites, beginning with the lowest and working up. Any site, we thought,

would be satisfactory, and each seemed more attractive than its predecessor, until at the end with one accord we all exclaimed "This is it". There seemed no doubt as to its superiority. The view is the best, the road runs nearest and holds no prospect of passing traffic, and power lines, always an eyesore, cannot be seen there. So we drove in four pegs to represent the corners of the lodge. On them we wrote "Forest and Bird Lodge". One purist added the word "Royal". We felt that at last the lodge was under way.

Our next task is to level the site. It is unlikely that a bulldozer will be available (Has any member a portable bulldozer?); so we must organise working parties. Over Labour Weekend, we say the foundations *must be laid*. This Easter our architect is visiting the site and will subject the plans to a final and exacting scrutiny. These completed, we hope to send to Branches and Sections the revised copy.

So, briefly, this is where we are. As our prospectus states, the building of the hut will be fun. Do join us in this hunt for funds, then later in the working parties. It will be good to see you.

Supplementary list No. 2, to 31 March 1963. ——

Brought forward: £1,547 4s. 6d.

At 5s. Miss F. Kimbell; at 10s. W. Dorflinger (2); at £1 Miss R. Teague, Miss B. Jackson, Mrs. S. M. Reed, J. S. Nixon, John Arthur, Mrs. J. K. Weir, Miss I. C. Wilson, A. Anderson, N. Pointon; at £1 1s. G. I. Fairbairn; at £1 15s. A. E. Morrell; at £2 F. G. Kerr, E. R. Dearnley; at £2 2s. Mrs. A. McPhail; at £3 3s. Mrs. B. M. Milne; at £5 R. S. Davis, T. Shout, H. and B. Price, N. C. Lambrechtsen, Miss J. Johnston, H. S. Gray, A. R. Marshall, T. M. Barrett, Miss M. E. G. Kite, R. S. Sibson, E. J. and G. Moore, D. R. Worsley, Mrs. N. F. Rider, Mrs. L. N. White, W. H. Bruce, Mrs. E. Gahagan; at £5 15s. Miss J. A. Newman; at £10 Miss S. G. Lynch, Miss J. L. Anderson, Miss N. P. Turner, Mrs. D. E. Weston, P. A. Pritchard; at £25 E. Paulger. Total to 31 March 1963, £1,729 15s. 6d.

Auckland Branch Notes

One of our most interesting and successful ventures was a large-scale tree planting at the Society's property at Onetangi, Waiheke Island, on Saturday, 18 August. An appeal to members to bring or send a tree or a donation to the bush-development fund resulted in about two hundred trees being delivered to the property. A wet morning undoubtedly affected attendance but over sixty people, suitably dressed for the occasion, braved a choppy sea and joined with Waiheke members, some of whom had dug holes for the trees the previous day. The weather had cleared by the time we reached Waiheke and planting proceeded with enthusiasm.

After an unusually calm winter a trip to Muriwai Beach in July did not yield anything to the "beachcombers". Sometimes unusual birds and numerous petrels are washed up on this beach in winter. Rain set in during the afternoon and caused our early departure. August's outing to Ngaheretuku, the Society's bush property at Clevedon, was most enjoyable, being the first time that we have done more than merely skirt the fringes of this bush en route to somewhere else. In the morning we visited a delightful little reserve of kauri bush owned by Messrs. Henderson and Pollard in the hills at Whitford.

The trips for September and October were transposed to fit in with the Cheeseman Memorial Native Flower Show; so we went to Lake Whangape on 22 September and saw huge flocks of black swans and cygnets there. We then called on Mr. C. Couzens at Waerenga and ate our lunch in his beautiful garden, afterwards walking through his plantation of native trees.

The Annual General Meeting on 9 August was quite well attended and the following officers were elected: Chairman, Mr. W. T. Slater; Vice-chairmen, Mr. R. B. Sibson and Mr. M. G. Fowlds; Secretary, Mrs. E. L. Fooks; Assistant Secretary, Miss M. Spicer; Treasurer, Mrs. M. Reed; Committee: Mrs. J. Prickett, Mrs. C. A. Corban, Mrs. A. P. Lynch, Mrs. H. E. Read, Miss D. Nairn, Miss M. Russell, Mr. A. V. Piesse, Mr. B. Hall. Slides taken by various members were shown after the business meeting.

We have had some excellent movie films from the U.K. Information Office and the National Film Library and on 11 October Mr. R. B. Sibson gave a talk, illustrated by slides, entitled "Wandering in the South Island".

WATER: By an Old Timer

Sixty years ago at my home in the Hutt Valley we had to rely on tank water for all our household needs. Water for all purposes was severely rationed and in the summer during dry spells we had to carry water quite some distance from where there was an artesian well. To leave the tap dripping or running was at any time a crime meriting severe punishment. I do not think we ever had a test for the purity of the supply, but I do know that every now and again when rain was fairly certain we had to drain the tank and remove two or three inches of sediment from the bottom. We also had to clean dust and less appetising things such as bird droppings from the roof of course. Nevertheless we survived. When finally we were connected with a town water supply it was an almost incredible improvement in home life, but for years we preserved the habit of being meagre with our usage of water. Unfortunately too many folk today take a plentiful and pure water supply for granted and I fear many badly misuse it; but it will not always be so because one of the big problems the peoples of the world will have to face in the years ahead will be the provision of pure water to meet the demands of greatly increased populations associated with the tremendous demands for water made by modern industry. The July issue of the Canadian *Wildlife Review* gives the following interesting information on the subject: "An infant's body contains 70 to 80 per cent water, adults 50 to 60 per cent. Losing 10 per cent of the body's water is serious, 20 per cent usually fatal. A person usually secretes two quarts of water per day and that amount of liquid should be taken to replace that lost through perspiration, breathing, etc. Incidentally a normal person drinks a ton of water every year. One function of water in the body is to allow you to perspire, which cools you. When one pound of water is evaporated it takes away enough heat to raise 5½ pounds of ice to boiling point. (A calorie, incidentally, is defined as the amount of heat needed to raise one kilogram of water one degree centigrade). The ocean contains 97.39 per cent of the earth's water; if all the continents sank below the sea the level of the water on the earth would be about 9000ft.

Photo: P. J. M. Isaacs

The huge rata in Urewera National Park.

This tree possibly developed from three vines that later grew together. It is 40 ft. around at the base.

"Someone has calculated that the water in the ocean weighs about 1,400,000,000,000,000,000,000 tons. Now that's an awful lot of water but unfortunately it is so loaded with salts that without careful treatment it cannot be used for drinking. Fresh water available is comparatively a small amount and on that the demand is increasing terribly. The American Machine and Foundry Company has estimated that in 1900 Americans needed 40 billion gallons of water per day, now they need 312 billion gallons daily and this is expected to increase to a demand for 453 billion gallons daily by 1975. This has to be produced from sources many of which are becoming so polluted that they are causing the gravest anxiety to the authorities." [*Note:* An American billion = 1,000 million.—Ed.]

New Zealand has been blessed with a wonderful water supply, but it should always be remembered that it is not inexhaustible. Every effort should be made to prevent pollution and to see that our great steep water-catchment hills are never denuded of their native bush. No other covering is so effective in regulating the raindrops where they fall and thereby preserving our soils and water.

Copies of Rachel Carson's book "Silent Spring" are now obtainable from the Society's Head Office, price 25s.

Waikato Section Notes :

Maratoto Excursion

Waikato Section recently held a day excursion to Maratoto near Paeroa. Members arrived in eighteen cars which forded the Hikutaia River and parked beneath a bush-covered hill. The party had an early lunch, after which Mr. A. S. Gray gave a brief history of the area. The members then sorted themselves into three groups, one to go to the top of the range, another to study geology around the mine and the third to botanise in the vicinity of the cars.

The summit party found the track which went over the range to Whangamata almost up to vehicle standard. They saw white flowers on the hinau trees in great profusion. *Senecio kirkii* a plant which often grows as an epiphyte or perching plant was also in flower; again the flowers were white, but these were larger, being up to 2in. in diameter. T. F. Cheeseman in his *Manual of the New Zealand Flora* described them as "A very remarkable and beautiful species. The flower heads are often so abundantly produced as to conceal the leaves, the multitude of snow-white rays then rendering the plant conspicuous from afar." Several pigeons were seen and many tuis were seen and heard. Pipits, silvereyes, and fantails were also observed. The whole area was a cut-over kauri forest and although many kauri trees were to be found there were no forest giants amongst them.

The group which visited Maratoto mine found that it was still being worked by a solitary miner. The geologists in the party studied the rock formation and found quartz, which is an indication that gold might be found. They also saw *Gaultheria* plants covered in white berries and an occasional one with bright pink berries. The 18-inch high plants of the orchid *Thelymitra longifolia* were flowering fairly abundantly, members seeing flowers ranging from bright blue through shades of pink and white.

The members that remained near the river found taurepo *(Rhabdothamnus solandri)* in flower by the water's edge. This small shrub bears bright orange blossoms. The largest trees seen were tawa. Two smaller trees tawhero *(Weinmannia sylvicola)* and *Pseudopanax discolor* were numerous; these trees are rarely found in the Waikato area but are plentiful from Auckland and Thames northwards. The *P. discolor* has leaves of an attractive shade of bronze. Several other plants of special interest to members were found including the perennial herb *Cladium sinclairii* and the orchid *Orthoceras strictum,* both of which were in flower. The total number of plants seen in the area was 130.

★ ★ ★ ★

Tapuaenuku Scenic Reserve

An area of 5,500 acres in the Inland Kaikoura Range has been established as the Tapuaenuku Scenic Reserve according to an announcement by the Minister of Lands (Hon. R. G. Gerard). It will comprise all the land above 6,500ft. surrounding Tapuaenuku (9,465ft.), Mt. Alarm (9,400ft.) and Mitre Peak (8,600ft.) at the northern end of the range.

The area is popular with mountaineers and trampers, particularly from Marlborough and Wellington, and reservation will give the public free right of access. The reserve has legal access from Blenheim through the Awatere valley and up the Hodder River.

While the proposed reserve is mostly bare rock and scree it is interspersed with small mountain shrubs and odd patches of tussock. Reservation of the area has been made possible by the cooperation of local landowners, said Mr. Gerard. Part of the new reserve was previously vacant Crown land, some was included in pastoral licences, and the rest held under freehold title. The landowners have willingly made the land available, said the Minister.

Mt. Tapuaenuku is the highest mountain in New Zealand outside the Southern Alps and a winter ascent of it is not recorded until 1941. The precipitous peak of Mt. Alarm was not climbed until 1928.

The editor regrets that he carelessly credited to the National Publicity Studios the fine photo of bellbirds feeding from a jug. This photo, which appeared on page 19 of the November 1962 issue of *Forest and Bird,* should have been credited to Mr. R. H. Blanshard, who is caretaker of the Little Barrier Island sanctuary and a well known authority on wildlife.

Secretary's Column

Members are reminded that the 35th Annual General Meeting will be held in the Central Library Hall, Mercer Street, Wellington, on Saturday, 1 June, 1963, at 9.30 a.m. See agenda, February Journal, page 31.

At the evening function Mr. L. W. McCaskill will deliver the Sanderson Memorial Address entitled "Captain Sanderson, the Man and His Work."

Missing Friends

From time to time journals are returned by the Post Office marked "Gone, No Address" because the member had omitted to advise Head Office of a change of address.

The following is a list of members whose *Forest and Bird* journals have been recently so returned. Can any member please supply any address?

Name and last known address:

Mr. Garry S. Brosnan, Tahora, via Stratford.
Mrs. M. E. Dawson, 133 Donovan St., Blenheim.
Miss A. E. Perrett, "Armley", Tutekehue.
Miss Carol Potter, "Aylestone", Ruahine Rd., Mangaweka.
Mr. C. Nelson White, P.O. Box 315, Hamilton.
Mr. S. G. Whittall, 97 St. Hill St., Wanganui.
Mr. J. W. Barrett, c/o W. N. M. Smith, Greenvale Down, R.D.5, Gore.
Mr. W. R. Cooke, Bethlehem, R.D.2, Tauranga.
Mr. A. R. Foley, Oxford Terrace, Lower Hutt.
Mr. J. P. Fahey, 72 Koromiko Rd., Gonville.
Miss M. I. Hellyer, Blue Waters, 85 Bisley Ave., Nelson.
Miss Ruth Hills, No. 1 R.D., Ohaupo.
Mr. A. B. Lock, 67 15th Avenue, Tauranga.
Mr. G. Phillip, 20 Willcock St., Kaiapoi.
Mrs. C. Wallace, No. 2 R.D., Morrinsville.
Miss Frances Wilson, 2 Hinau St., Linden.

JUNIOR SECTION *

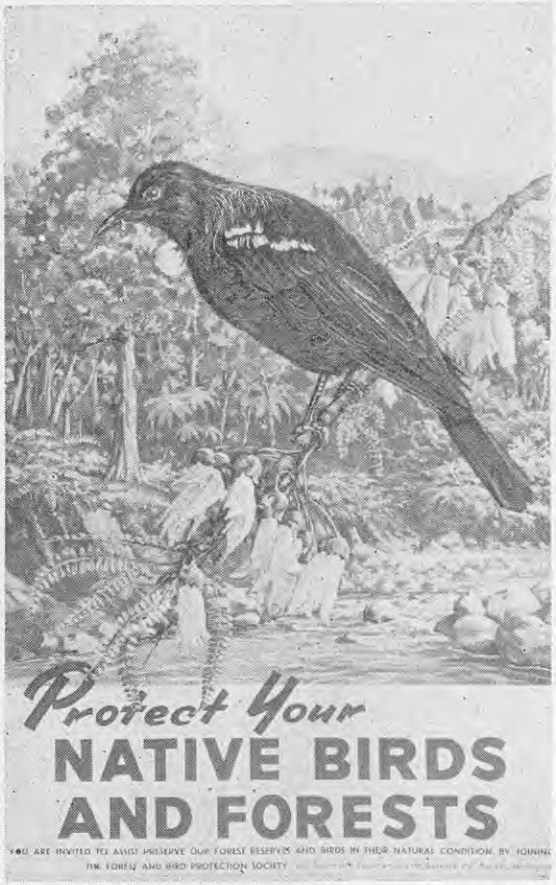
THE TUI

by the Wildlife Division, Department of Internal Affairs

Captain Cook, anchored at Dusky Sound in 1773, made the following entry about the tui in his log—"Under its throat hang two little tufts of snow-white feathers, called its poies, which being the Otaheitean word for earrings, occasioned our giving that name to the bird; which is not more remarkable for the beauty of its plumage than the sweetness of its note. The flesh is also most delicious, and was of the greatest luxury the wood afforded us." Cook's praise of the tui's plumage and song were well merited, and the Maoris agreed with him that it made good eating. It was highly prized by them as an article of food and despite strict protection it is still taken today in certain bush areas, although it is obviously no longer needed as food. With the clearing of much bush for farming and the consequent reduction in food supply, the number of the tuis decreased considerably over the first half century or so of white settlement. The tui remains scarce today in some parts, but generally speaking it is fairly common in forest areas and in many bush areas near settled districts throughout the country.

Slightly longer than the introduced blackbird, with shining metallic bluish and greenish black plumage, the tui is distinctive because of the two dangling tufts of white curved feathers at its throat and the silver-grey filaments on its neck. From these it takes its nickname of the "parson bird".

But if this name seems to imply a solemn, dignified character in the tui, it is mistakenly bestowed, for although the tui is a gay, cheerful bird he is bold and courageous and one of the most pugnacious in the bush. Guthrie-Smith, in his *Birds of the Water, Wood and Waste,* mentions that a tui was once observed chasing the much larger native pigeon. When the latter settled itself down on the branch of a tree, the tui, still not satisfied that the pigeon had removed itself as far as it might, sidled up the branch to give it a firm dig in the ribs. The tui has incurred the unpopularity of other birds for its aggressive habit of frequently chasing them.



Most Juniors will have seen this fine painting of the tui. Copies of this poster (in colour) may be obtained from Head Office for 1s. 6d.

But sometimes the tables are turned, for there are cases on record where they have been attacked by companies of blackbirds and starlings and have been forced to either make an ignominious retreat or be killed.

The tui is one of the finest songsters in the New Zealand bush, and one of the most frequently heard; for it sings as early in the morning and as late at night as the other bush birds. It has an extensive repertoire of musical notes intermingled with a variety of other gurgling, clucking, chiming, jangling, and wheezing sounds. Its exuberant outpouring of song ceases about sunset. From a distance some of its notes resemble the tolling of a bell. Its song is heard more during the breeding season,

* SPONSORED BY J. R. McKENZIE TRUST.

from late September to early January, than at any other time. The hen bird even sings while sitting on the eggs—a most unusual phenomenon in the bird world. The tui is a competent mimic; it was popular among the Maoris as a pet and was taught to call greetings to visitors arriving at the pa.

The tui's flight is as distinctive as its song. It is rapid and noisy, and the rustle of its wings is clearly audible. The tui's most characteristic haunts are among the outskirts of the bush and the tree tops, where the flowers and fruits which form its chief source of feed are found. Groups of tuis can sometimes be seen giving their version of a jetobatic display, flashing and darting in the air, then diving suddenly to disappear among the trees.

Tuis find their main food supply in the berries and nectar-bearing flowers of the forest. They feed on mahoe, coprosma, supplejack, maire, mako and karaka berries and the flowers of rata, kowhai, rewarewa, fuchsia, and flax. The tui's tongue, which is tipped by a very fine brush, is especially adapted for extracting nectar from flowers. In winter, when the berries are past, insects form the mainstay of their diet. During the winter months, in their search for food, tuis move about much more and are often seen in the gardens of more settled areas. The tui has adapted itself more readily than many other native species to the changing pattern of European settlement. Many settled areas now have well established gardens with various nectar-bearing shrubs such as rhododendrons, acacias and eucalypt. Occasional stragglers are seen searching for food in exotic pine forests. The tui with other birds plays an important role in the regeneration of our native bush. When it thrusts its beak into flowers for nectar, pollen settles on its head and it then carries the pollen from plant to plant. In addition it destroys various insects harmful to trees.

The tui's nest, which is usually built in a tree some ten to thirty feet above the ground, is a wide shallow structure of sticks, leaves and moss, insecurely attached to its site. The inside of the nest is lined with grass or leaves and perhaps one or two feathers. The eggs, which are very pointed and white in colour with a faint rosy tinge, are usually laid from October to December; there are three or four eggs in a clutch.

Nature Notes for Winter

Winter is almost upon us and many of the birds we have become familiar with during the summer have left our shores, notably the godwits and knots, who have set out on their long journey to Siberia and Alaska, while the shining and long-tailed cuckoos have left for the tropical islands such as the Solomons and Tahiti and the banded dotterel has crossed the Tasman to Australia. However, not all the bird population goes away. The first-year godwits remain behind and some of the other species are still represented, but in very much reduced numbers. While these birds are not so noticeable locally, migrants move north from the South Island or from inland localities to gather on our estuaries and seashores. You will notice the large number of South Island pied oyster-catchers, or if you are more fortunate and live near Auckland, you may see the flocks of wrybills on the Manukau Harbour or the Firth of Thames.

Storm Wrecks

With the winter comes the rough weather, and many of the oceanic birds, such as the albatrosses and mollyhawks, find it difficult to obtain food at times. The result is that after heavy storms many perish and some are cast up on the beaches right around the country. If you take a walk along the beach straight after a long stormy period, you may find interesting specimens; for instance, last year on Ohope Beach two rare petrels never before recorded in New Zealand were recovered and made wonderful museum specimens, and a wedge-tailed shearwater from distant Hawaii was found at Makara (near Wellington). Many of these birds are difficult to identify, especially after they have been on the beach for some time, because often the hungry gulls will tear them about and eat parts of them. Identification of some may prove rather difficult, so it

does pay to send them to a museum to find out what they may be.

As you will remember from the last journal, mention was made of the scheme for banding red-billed gulls so that if any dead specimens of this species or any bird with a band is located you will contribute greatly to the success of the scheme and to science generally by removing the bands and forwarding them as instructed with details of where and when the birds were found.

As for the sea birds, so with the bush birds in the scarcity of food in the winter. The berries will be harder to find and later in the winter the pigeons will resort to eating leaves only. You can help the birds of your district by putting out various forms of food—honey or sugar water for tuis, bellbirds, and silvereyes, and scraps of fat and suet and bread crumbs for the more common introduced birds.

By August you will have noticed that the birds are beginning to herald the approach of spring by singing, and you will hear bellbirds, thrushes, grey warblers, and a few others singing strongly as they mark out their claims for breeding purposes. Have you ever thought of keeping a record of when the various species of birds start to sing and how long they do so through the year? Such records could prove of great interest, especially if done over several years.

The Forest

In the parks and around the towns where many streets are lined with introduced trees such as oak, lime, plane, maple, etc., as autumn progresses everyone knows the leaves turn beautiful colours and then fall, leaving the trees looking bare and lifeless. However, the New Zealand native trees are almost all evergreen and stay covered throughout the year. There are exceptions, however, these being the houhere (the mountain ribbonwood), the kotukutuku (fuchsia), and the kowhai before it bursts into bloom and tells us that spring is here. Nothing of great interest is to be found in the bush during the worst of the winter months, and mud and rain make it a good place to stay away from. Long winter nights then will give opportunity to work out plans and schedules for what to look for and what to see when the weather becomes better and the bird calls invite you out to look for them.

JUNIOR ALONG THE TRACK

Nelson—Our home in Nelson is beside the Maitai River. Although we live near the town we are fortunate in having many native trees in our garden. Many birds live in our garden and I enjoy watching them. My favourite birds are the tuis. There is a big puriri tree just outside our kitchen. The tuis spend hours singing in the puriri tree and drinking the nectar from its flowers. Last winter I hung jars of sugar and water in the puriri tree. This kept the tuis here all winter. Unfortunately the tuis did not nest in our garden, though they visited us frequently to enjoy the kowhai trees. To my delight, this summer the garden has been alive with the song of tuis. All through March the tuis have been sucking puriri flowers. This tree has thousands of red berries and flowers at the same time. I watch them out of the windows. Several of the tuis have no white tuft. Mrs. Moncrieff told me that these are young tuis and they will have white tufts by next spring.—*Barry Spear, 12 years.*

Christchurch—We thought perhaps you would be interested in the unusual behaviour of three baby riflemen and their parents. We have watched riflemen at this time for many years from a cottage in the Craigieburns, but none have behaved quite like these. We had heard them twittering under the house for some time, and one Saturday morning while we were having breakfast on the veranda they flew out just beside us, and the young ones tried out their wings while we and their parents watched. They moved into and around a prickly shrub just near the veranda. We had quite a lot of visitors during the day. The weather was extremely hot, too hot for walking far; so we stayed in the shade just near the bush where the birds were; in fact, we were making quite a lot of noise. The three birds formed a nest in some leaves by lying with their heads together in a circle, under the bush, but quite in the open. By 6.30 p.m., when we were getting ready to have a meal at a table near this bush, Mum was getting a bit worried and wondering if we should move them to a safer place after dark. Then the parents, who had been around most of the time, stirred up the babies, and to our great amusement they had a game of chasing on the wing and on the ground, finally working their way up into a hawthorn bush, where they spent the night. There are a great number of trees around the cottage offering safety and privacy to baby birds; then why should they spend the day on the ground in the midst of a lot of noisy humans?—*Alan and Hugh Best, 15 and 14 years.*

Rotorua—While holidaying at Ohiwa we saw fairy terns flying towards the entrance of the harbour but never saw one flying the other way. Each tern had nesting material. Then one day I went fishing at the entrance. It was then I found out that each tern which came down with nesting material would join in the others which were circling around and then land. On the last day of our holidays we again went down to the entrance. This time we saw about 300 to 400 birds on the mud flat and about 20 birds diving for fish. We also saw mutton birds when out in the ocean out of the Whakatane Heads.—*Wayne Miller, 10 years.*

Dunedin—While spending a holiday at Queenstown I had the time to study some black-billed gulls. I noticed that they were identical except for the colouring of their eyes. Some of these gulls had black eyes and some had white with a small red ring in the centre. To observe them I made a "hide" in the rocks and took a photograph of them, encouraging them with bread. After some time I realised that the birds with brown on their feathers (which are immature birds) had the black eyes and as I was feeding a lame one off my hand I noticed that faintly in the middle of the black eye there was a dark ring. I came to the conclusion that when the young birds have black eyes and adult plumage, they are about two years old, and as they grow older their eyes become ringed.—*Stephen McElrea, 12 years.*

[Your careful observation is of great interest. The young birds, as you say, have darker eyes and become lighter as the birds grow older, but the change over is between the end of the first year and the middle of the second, that is when the birds are about eighteen months old.—Ed.]

Christchurch—During the August holidays my mother, sister, and I were staying at our bach on the New Brighton sandspit when we noticed a lark, continually landing and taking off, on our property, not far from where we were sitting in our doorway. My mother said it must be feeding its young, so when it was away we quietly searched for its nest, time and time again. At last we found it, well hidden under a clump of grass. We had to lift up the overhanging grass to see in, and there, in what was almost a tunnel, were four baby larks, still in the down. We were most careful not to disturb them and left at once. When we looked a fortnight later they had gone.—*Mary Williams, 13 years.*

New Plymouth.—I have sent a list of birds I have observed round the New Plymouth district. In Pukekura Park there are tuis, ducks by the score, bellbirds, and wood pigeons, as well as mynahs, blackbirds, sparrows, thrushes, and other common birds. At the back of Paritutu Rock there are white-fronted terns, and black-backed and red-billed gulls, and I have found a blue penguin washed up at Hawaroa (New Plymouth). Out by Egmount Road there are pied stilts (eight or nine) and a few ducks on a small pond. Out towards the coast there are pukekos, quails, kingfishers, harriers, pheasants, goldfinches, banded dotterels, magpies, moreporks and waxeyes. —*Tony Nielsen.*

Buller—Our house is two miles from Westport, at Carter's Beach. It is a wonderful place for bird watching as we have a beach a quarter of a mile away, a swamp next to the house, some bush by the side of the farm, and a lake in our neighbour's farm. I see a large number of birds: fantails, waxeyes, chaffinches, yellowhammers, thrushes, tuis, bellbirds, native pigeons, shining cuckoos, wekas, pukekos, wild ducks, moreporks, seagulls of all kinds, and all the more common birds such as starlings. I have seen one or two white herons in the bird sanctuary one mile from our place in a lagoon. Bitterns are often seen and are gradually increasing, but aren't seen as much as the pukekos and their young. So I see many birds of different sorts when I go wandering through the bush with the farm dog. —*Raymond Bruning, 14 years.*

Rotorua—While visiting Te Mahoe I saw a native wood pigeon, the first one I ever saw. In the bush I saw tuis, fantails, and bellbirds. Going over we saw a white hawk. We wonder what type it was.—*Wayne Miller, 10 years.*

[Probably an old male (native) harrier hawk.]

Sumner—Sometimes a thrush comes on to our lawn. He is here today and Mummy and I watched it through the kitchen window. He puts his head down and cocks it on one side; then when he hears a worm under the grass he quickly put in his beak and pulls it out and swallows it. He does not always get a worm but he always tries again. He has just got a large bundle of worms in his beak and I think he must have some chicks somewhere. We have a lot of trees around the house and we get sparrows, blackbirds, starlings, thrushes, waxeyes, and sometimes bullfinches and goldfinches.—*Jane Leeburn, 10 years.*

Christchurch—One day we went over to Pigeon Bay to cut gorse. As I entered the bush there I caught a glimpse of a few manuka still in flower. It was in the bush; the only sound was of the swishing of the stream, and bellbirds calling. The track I was following soon came to an end, and I had to force a way through the bush, slipping and sliding and grasping hold of roots of trees to haul myself up to level ground. I was about to cross the creek when a continuous chirping broke out in some bushes near me. At first I thought it was made by crickets, but an investigation yielded a pair of riflemen searching for insects among the branches. After crossing the creek I startled a tui two or three feet away from me. Before it flew away I had a chance to study its greeny-blue plumage and the tuft of feathers on the throat. I was amazed at its size. The riflemen's chirping was almost unending, and up in the treetops brown creepers were moving about in small flocks, stopping at intervals to feed their young. My attention was focused on a male rifleman who, with an insect in his bill, flew to a gorse bush. Reappearing a few seconds later, and flying back into the bush, he repeated this twice. I knew they had a nest there, but I did not intrude for fear of disturbing the birds. I think the rifleman doesn't mind gorse thickets. As I walked up the cut-over gorse to join the rest of the party I disturbed two Californian quail who ran chuckling into some manuka bushes. Later I saw a pigeon and a tui fly over. On previous trips, I have seen a shining cuckoo and a South Island tomtit; also down at the bay there are penguins and shags.—*Barry Ashworth.*

Hutt—Around the Hutt Valley there are a number of birds, tuis, shining cuckoos, long-tailed cuckoos, fantails, wood pigeons, gulls, warblers, pukekos, bitterns, chaffinches, waxeyes, sparrows, blackbirds, and thrushes. Sometimes you can see grey ducks at the swamp. I have seen only one shining cuckoo and that was at a swamp at the river. At the swamp there are a lot of nests in the willows, and many frogs can be heard croaking in the summer. At night you can hear moreporks.—*Nigel Hooper, 10 years.*

(Three shillings will be paid for each item published in "Junior Along the Track". Please give your age when you write.)

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APPEAL FOR BEQUESTS

Is there any cause more worthy of bequests by public spirited citizens than the objectives of the Royal Forest and Bird Protection Society, which is working wholly and solely for the welfare of New Zealand, present and future? Here is a suggested form of bequest:

"I give and bequeat the sum of .....to the Royal Forest and Bird Protection Society of New Zealand (Incorporated), and I declare that the receipt of the Treasurer for the time being of the said Society shall be a complete discharge to my executors, for the legacy hereby given to such Society."

OBJECTS OF THE SOCIETY

To advocate and obtain efficient protection of our native forest and birds and the preservation of sanctuaries, and scenic and other reserves, in their native state, and to enlist the practical sympathy of both young and old in these objects.

The Society invites all those who realise the great economic and aesthetic value of our native birds, and who wish to preserve our unrivalled scenic beauties, to band together with it to carry out these objects.

The subscriptions are: Life Member £15; Endowment Members 25s.; Ordinary Members 15s.; Junior Members (under 17 or at school) 7s. 6d. per annum. Endowment Members are those who desire to contribute in a more helpful manner towards the preservation of our birds and forests. This magazine is issued to all members without charge.

The Royal Forest and Bird Protection Society of New Zealand (Inc.) is:—
Convening and Secretarial Member of Nature Protection Council of New Zealand.
National Section of the International Committee for Bird Preservation.
Member of the International Union for Conservation and Natural Resources.

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Photo: Bernard Teague

Kopi, the largest kauri tree in New Zealand, Omahuta Forest. Photo taken on occasion of visit to Omahuta Forest by members who attended the Kaikohe camp (story in next issue).

Photo: N.Z. Forest Service (J. H. G. Johns, A.R.P.S.

This view shows two bad slips, which are being further eroded by the formation of gullies. There are numerous smaller slips, and between the two large slips there is seen slumping that may develop into another large slip. Note how the products of erosion are filling the valleys. Erosion of this kind is brought about largely by removal of the original vegetative cover; but the nature of the underlying geological formations, the amount and frequency of rainfall, and other matters have to be considered when control measures are being planned. (Upper Waipaoa River, Poverty Bay.)