

Conserving our wetlands and water-birds



A flock of grey teal over inland water.

Few people would deny feeling a thrill at the sight of ducks, swans, and other water-birds gathering on our lakes and swamps, or winging their way across the sky. But we have to face the fact that if we are not careful such sights could become a rarity. Nobody has ever surveyed all our wetlands, so we don't know for certain which ones are most important for our water-birds. But we do know that they have become greatly diminished—especially in the southern half of the continent.

In one of the few surveys done, Mr Graham Goodrick of the New South Wales National Parks and Wildlife Service showed that by 1969 more than 60% of the best habitat in coastal New South Wales had been drained—mainly in the name of flood mitigation. In Western Australia Dr Tom Riggert of the local Department of Fisheries and Fauna found a similar situation on the Swan Coastal Plain. Even more must have been drained in Victoria. In addition, as a result of dams being built for hydroelectric and irrigation schemes, the rivers of the Murray-Darling system don't rise and fill the billabongs as often as they used to.

All these activities have reduced places where ducks and other water-birds can breed or flee during droughts. As far as we know, no species has yet died out because of them, but one, the freckled duck, is now considered to be threatened.

Recently the Australian government committed itself to carrying out a national wetlands survey. It's early days yet, and no details as to how it will be done have been worked out. Nevertheless, the survey should tell us which wetlands—fresh- or salt-water swamps, floods, and other shallow waters—are most important for water-birds. We will then know what should be done to preserve them. Also,

on May 8 this year Australia signed the *Convention on Wetlands of International Importance especially as Waterfowl Habitat*—and became the first country to unconditionally sign this United Nations-sponsored document. Signatories to the Convention must preserve as many as possible of those wetlands that remain within their territories.

By 'waterfowl' the Convention meant what we in Australia usually regard as 'water-birds'—ducks, geese, swans, coots, pelicans, the waders, and other birds that use shallow water. Australian ornithologists usually confine the term 'waterfowl' to the ducks, geese, and swans—the family Anatidae. An official list of our water-birds includes 103 species. Of these, 28 are found only on this continent.

Few migrate

Australia is unusual in that very few of its water-bird species regularly migrate outside the continent. In fact only 12 of the 103 do so. Sixty-three species are found overseas also, but they don't migrate regularly back and forth to Australia.

Very few of our water-birds have been scientifically studied in detail, so we know relatively little about most of them. However, over the last 20 years the ducks,

geese, and swans of the Murray–Darling system have received a great deal of attention, particularly from the CSIRO Division of Wildlife Research.

The Murray–Darling river system, Australia's largest, has immense importance for water-birds. For one thing most of the game ducks found in southern Australia breed in this region, and considerable numbers of birds spread out from here over the rest of the continent.

The rivers of the system rise in higher-rainfall areas in the highlands of the Great Dividing Range and meander across the flat plains to the west, forming effluent channels, swamps, and billabongs that make excellent places for waterfowl to breed. In years of high rainfall or snow-melt on the highlands, the rivers flood, creating many thousands of square miles of habitat suitable for waterfowl to breed in. When the floods fall and the billabongs dry out, ducks that have bred in the region spread out across the whole continent and, in some years, as far as New Zealand and other islands of the Pacific.

At least that is what used to happen, but the Snowy Scheme and other large hydroelectric and irrigation water storage developments use the waters of the Murray–Darling system. Already nearly half the mean natural flow of the system is drawn off for these purposes. And the floods that filled the swamps and billabongs happen less often than they used to. Consequently, some species of duck (and probably other birds) cannot breed so often.

Biologists from both CSIRO and the State Wildlife Departments have given us a fairly clear picture of how the dams and weirs of the irrigation and hydroelectric

... by 1969 more than 60% of the best habitat in coastal New South Wales had been drained—mainly in the name of flood mitigation.

schemes have affected duck-breeding. Many of these scientists' findings probably apply to other water-birds as well, and they illustrate well how a water-bird can adapt itself to living on a dry continent where rainfall is sporadic. They also show how sensitive management could maintain the existing species, or how mismanagement could drive some to extinction.

Australian ducks different

Most northern hemisphere ducks breed at the same time each year in response to the lengthening days of spring. Ducks in the Murray–Darling region also usually breed in winter or spring. But the early work of CSIRO's Dr Harry Frith, Chief of the Division of Wildlife Research, suggested that some species would only breed when flooding occurred. Such floods usually result from heavy rains or snow-melt in the watersheds far to the east rather than from local downpours.

Some ducks seemed to breed at any time of the year provided the river water levels rose enough. So the fact that the ducks of the Murray–Darling system usually bred in winter or spring could merely have been a reflection that in southern Australia most rain usually falls

during those months. Do our ducks breed in response to changes in day length, floods, or both? If they need floods, then we should make sure that our water-control schemes don't reduce flooding too much, or we may have no ducks. We do know that the white ibis, straw-necked ibis, and the Murray cod—a native fish—also breed only after flooding.

During the late 1960s Dr Frith and his colleague Dr Wayne Braithwaite sorted out the breeding question for nine duck species in a 5-year study of the water-birds at Barrenbox Swamp, some 19 km north-west of Griffith in New South Wales. Complementary studies in Canberra by Dr Braithwaite, using captive black duck and grey teal living under artificial lighting, confirmed their conclusions.

Barrenbox Swamp is artificial. It is a depression into which water from the Murrumbidgee Irrigation Areas drains for storage, so the swamp is permanent. The fertilizer-laden water stimulates a rich growth of water plants, particularly of cumbungi, a bullrush. As a result the swamp provides excellent habitat for many species of water-birds.

The water level of the swamp rises and falls at any time of year depending on the needs of the surrounding countryside for irrigation water rather than according to the rainfall further east. Thus the researchers could study the factors stimulating breeding irrespective of the season and weather.

What stimulated breeding seemed to depend on the ducks' way of life. It seems that each species will only breed when it is likely that food will be available for its young—an essential factor for survival in

The Convention on Wetlands

The *Convention on Wetlands of International Importance especially as Waterfowl Habitat* arose out of an increasing worldwide realization that since many water-birds migrate between countries and often between continents, measures taken to conserve them by one government are useless without complementary action being taken by others. In addition, the wetlands on which water-birds depend have diminished greatly across the globe as they have been drained to produce dry land.

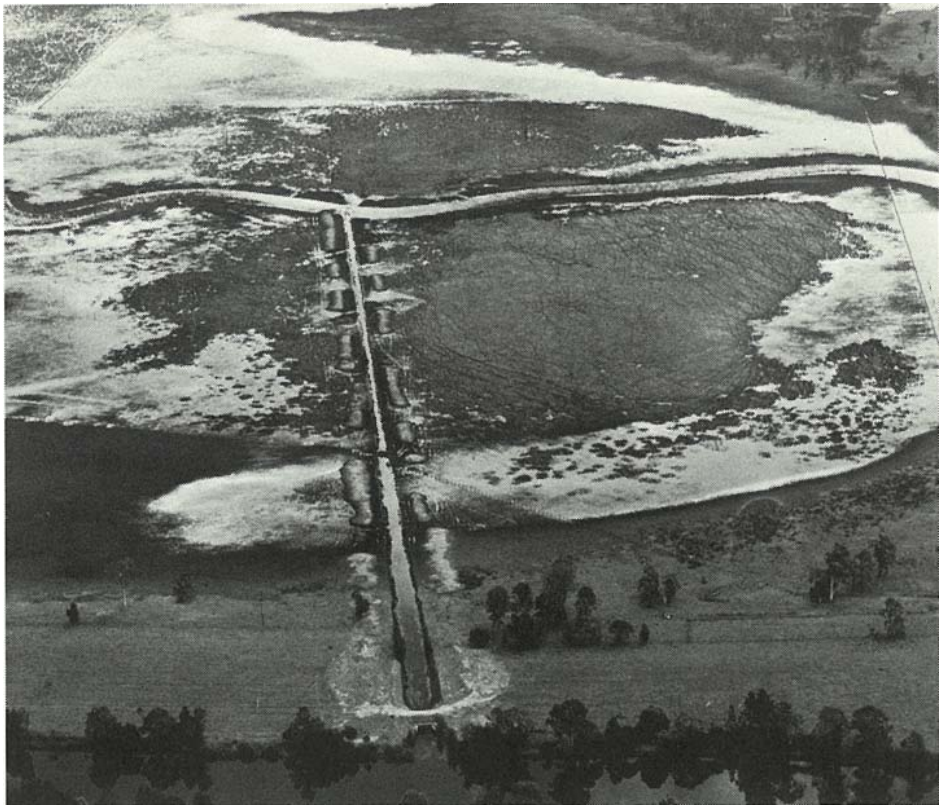
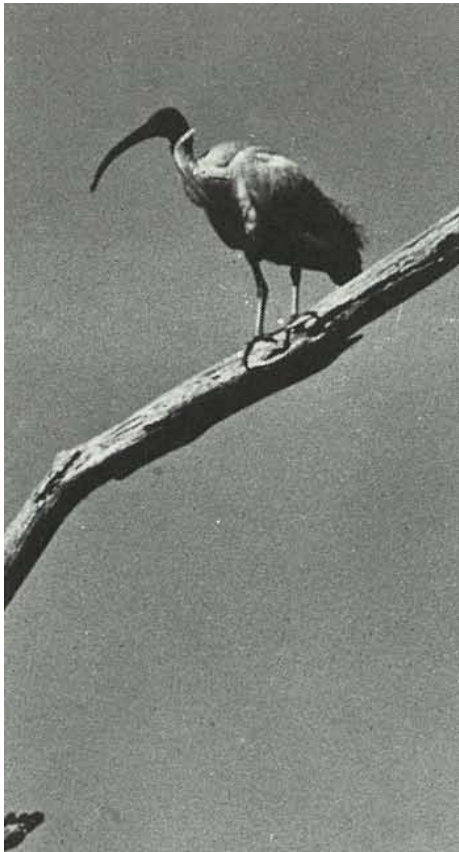
By signing the Convention, Australia committed itself to a number of actions to conserve its wetlands. First it had to design-

nate and precisely describe at least one wetland for inclusion in a List of Wetlands of International Importance. In the event, it designated the mangrove estuaries of the Cobourg Peninsula—habitat of the rare Burdekin duck and many other water-birds. The Australian government chose the Peninsula because, being in the Northern Territory, no constitutional problems would arise as to whether responsibility for its management lay with the Australian or a State government. Further wetlands will be added to the List later.

Australia undertook to promote the conservation of wetlands and water-birds

by establishing nature reserves on wetlands whether or not they were included in the List. It must also endeavour through management to increase water-bird populations on appropriate wetlands, and encourage research on the fauna and flora of wetlands.

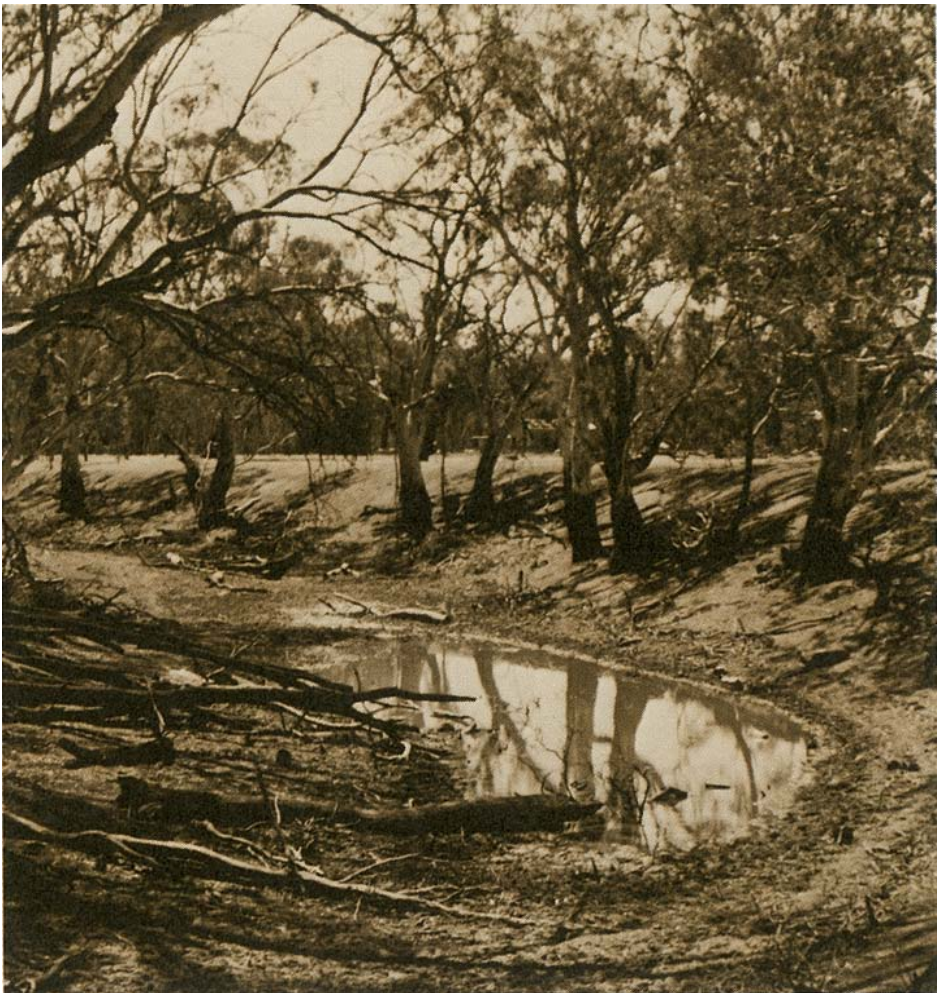
By signing, Australia has committed itself to the terms of the Convention for a minimum of 5 years. Finland, Iran, and the United Kingdom have also signed, but subject to further ratification by their governments. A number of other nations are considering following suit. The Convention does not come into force until seven countries have signed it.



**Flood mitigation channel in coastal
swamp near Lismore, N.S.W.**

**Straw-necked ibis (top) and royal
spoonbill.**

Ducks breed when the billabongs fill.





First catch your black swan, then band it.



A good catch—29-kg Murray cod.

... no species has yet died out, but one, the freckled duck, is now considered to be threatened.

Pink-eared duck.



Australia's erratic climate. Thus the sedentary musk duck, blue-billed duck, and hardhead tended to breed most regularly each year in winter or spring—presumably in response to the changing length of the days. These ducks live in permanent swamps where their food is always available, and they do not fly over great distances.

By contrast, the very nomadic pink-eared duck and the grey teal (a popular game duck) may fly right across the continent in search of suitable water. They bred at any time of year when their shallow-water food was plentiful. Usually this could be expected after flooding had occurred, but the water level rise in itself did not actually stimulate breeding, as had been previously thought. The right food had to be growing in the flood waters. The time of year appeared to have no effect at all on when these ducks bred.

Between these two extremes came the four semi-nomadic species studied—the black swan, freckled duck, shoveler, and that very popular game species, the black duck. These do not depend on the existence of permanent swamps to survive, but they do not fly the length and breadth of the continent in search of water either. Once again they bred when plenty of their particular food became available following flooding of previously dry lands, but only during the winter months. Apparently the shorter winter days made them ready to breed, but they did not actually do so until they had adequate food as well. Dr Braithwaite's Canberra experiments with black duck confirmed this finding.

Thus our sedentary ducks behave like their northern hemisphere counterparts—they breed when the days are short. The very nomadic ones breed at any time when food is available, while the semi-nomadic ones depend on both day length and food.

Coastal swamps needed

Even though the movements of the most nomadic ducks can be very extensive, Dr Frith considers that they are really no greater than is necessary to avoid the effects of drought. At first, most waterfowl congregate in the nearest permanent refuges such as the cumbungi swamps while these are available and the food in them remains suitable. Sometimes this is enough to avoid the effects of a dry spell. However, in more extreme conditions the birds disperse to more distant refuges, usually in those swamps that still remain on the coast.

But many of the swamp areas, especially in southern Australia, were drained early

Jabiru.



**Rough on people but good for ducks—
Murray floods May 1974.**



Masked plover.



Duck-shooting studied

Duck-shooting is popular, and it also supports a sizeable industry. A recent estimate suggests that there are at least 120 000 regular duck-shooters in Australia. These enthusiasts probably spend at least \$6 million on ammunition, travel, and other expenses—a figure that includes \$2 million-worth of shot-gun cartridges, most of which are locally manufactured.

In spite of this, until very recently nobody had made a study of how shooting actually affects duck populations. So it is hard to know what size bag limits should be.

To remedy this situation, Dr Braithwaite, and Mr Ian Norman of the Victorian Department of Conservation, co-ordinated a massive survey of a dozen widely separated sites in Victoria, New South Wales, and South Australia on the opening day of each shooting season for the years 1972, 1973, and 1974. They chose the opening day since most ducks are shot then. Assisted by an army of helpers from various government wildlife departments, the two researchers interviewed more than 1000 shooters on each opening day. They obtained a sample of no less than 12 904 shot birds over the 3 years.

Black duck and grey teal were the main ducks to be shot, but a very variable proportion of other less sought-after species were bagged at different sites.

Not surprisingly, the most crippling occurred where the cover was densest. On average, 3–4 ducks were crippled for every 10 bagged.

For a lot of shooters one can only hope that their enthusiasm made up for their lack of success. In 1973, a dry year,

shooters travelled an average of 276 km each way for their sport, and yet 47% of them failed to obtain a single duck. Less than 10% succeeded in reaching the legal bag limits in any year, and even fewer exceeded them. In fact these limits were probably having very little effect on how many birds were shot.

Dr Braithwaite and Mr Norman suggest that the hunting regulations should make sure that immature birds make up the majority of birds shot. In practice this does not always seem to happen, especially in drier years such as 1973 when less open water is available. That year 74% of the grey teal and 70% of the black duck shot were adults, and Dr Braithwaite and Mr Norman conclude that the rate of harvest may exceed the reproduction rate in such years, but more research is needed. They suggest that, in dry years, it may be necessary to change the bag limits to make sure that shooting doesn't jeopardize the duck populations' future. In flood years such as 1974, immature birds of all species predominated in the shooters' bags.

Black duck and mountain duck, and to a lesser extent other species, tend to return to the same refuges each year to moult. These refuges are often popular hunting places. This fact probably accounted for the high proportion of adults shot in dry years. Moulting ducks cannot fly so well, and hence they make an easier target. In addition, a number of completely flightless ducks turned up in the shooters' bags (not to mention the occasional galah, cormorant, stilt, and other protected bird). Dr Braithwaite and Mr Norman therefore suggest that the

best way to conserve large black duck and mountain duck populations may be to delay the start of the shooting season.

The great majority of shooters came from Melbourne and other main centres of population in southern Victoria—even at sites well into New South Wales. In 1974 a great many shooters understandably preferred to visit not-so-distant water such as Lake Buloke in the Victorian Mallee that had been dry during the previous years. This meant that shooters shot a greater proportion of grey teal, since these very nomadic birds make the greatest use of transient water. However, they seemed well satisfied with shooting grey teal.

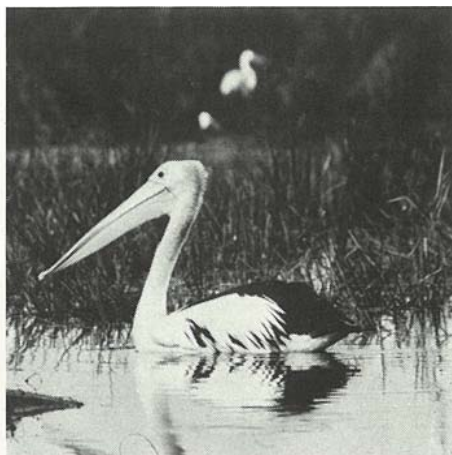
This fact does suggest a practical step in waterfowl management in south-eastern Australia. Grey teal are plentiful and breed prolifically whenever flooding occurs. Artificially flooding suitable areas located within a reasonable distance of the heavily populated areas of Victoria would attract grey teal and shooters. The hunting pressure could thus be taken off the more distant refuges that are so important both to the common game ducks during moult and to other less-abundant duck species.

The 1972 open season on waterfowl in south-eastern Australia. L. W. Braithwaite and F. I. Norman. *CSIRO Division of Wildlife Research Technical Paper No. 29*, 1974 (in press).

The 1973 and 1974 open seasons on waterfowl in south-eastern Australia. L. W. Braithwaite and F. I. Norman. *CSIRO Division of Wildlife Research Technical Paper*, 1975 (in press).

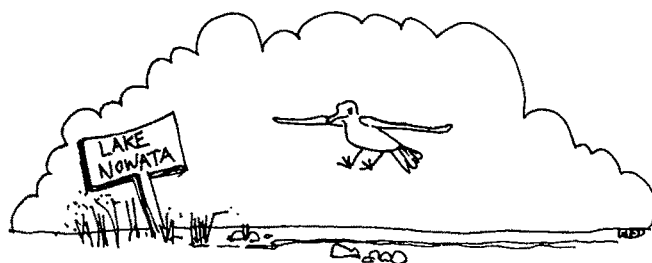


Black-winged stilt.



Australian pelican.

Burdekin duck.



in our history to provide more grazing land, and draining for development still continues apace. The areas that remain cannot support many of the birds from the inland, and when large movements to the coast do occur huge numbers die.

Species depending on the coastal refuges include the main game ducks—the grey teal and black duck. So their continued existence in large numbers depends not only on what happens to their breeding areas inland, but also on the sizes of refuges remaining on the coast. Destroy the coastal swamps and duck numbers will go down, regardless of what happens to the permanent swamps inland.

In recent times a great deal of money has been spent on flood mitigation works.

... sensitive management could maintain the existing species, or mismanagement could drive some to extinction.

For instance, this work was greatly accelerated by the New South Wales *Grant (Flood Mitigation) Act* 1964, under which the Australian government supplied \$8 million on a dollar-for-dollar basis. Under this *Act*, flood mitigation works were undertaken in the Tweed, Richmond,

Clarence, Macleay, Hunter, and Shoalhaven valleys. Usually flood mitigation work has involved building levee banks to protect low-lying ground from flooding, and cutting channels to speed river flows and to drain swamps, lagoons, and billabongs.

In spite of this, Dr Frith points out that the size of duck populations could be kept at a larger level during droughts if the irrigation areas could be managed so that the ducks could have adequate feed to stay inland—thus reducing the pressure on the remaining coastal refuges. He suggests that this could be done for relatively little cost, and with little loss of water for irrigation.

He and his colleagues have shown that the permanent cumbungi swamps created by the irrigation works form very good wildfowl refuges. They suggest that a practical step towards waterfowl conservation would be to provide quite simple engineering works designed to increase the number of permanent inland cumbungi swamps. For example, some of the larger billabongs could be dammed to retain water permanently after flooding, their levels being subsequently maintained by pumping. Again, existing swamps could be managed to ensure that the water level, at least in some parts, remains reasonably constant so that plants that grow around the edge—the food of the nomadic species—remain plentiful.

More about the topic

'Wildlife Conservation.' H. J. Frith. (Angus and Robertson: Sydney 1974.) Waterfowl in an inland swamp in New South Wales. I. Habitat. II. Food. III. Breeding. L. W. Braithwaite, H. J. Frith, and J. L. McKean. *CSIRO Wildlife Research*, 1969, **14**, 1-16; 17-64; 65-109.

Environment and timing of reproduction and flightlessness in two species of Australian ducks. L. W. Braithwaite. *Proceedings of the 16th International Ornithological Congress, Australia*, 1974 (in press).

Breeding seasons of waterfowl in Australia. L. W. Braithwaite. *Proceedings of the 16th International Ornithological Congress, Australia*, 1974 (in press).

A survey of wetlands of coastal New South Wales. G. N. Goodrick. *CSIRO Division of Wildlife Research Technical Memorandum* No. 5, 1970.

Breeding, movements, and conservation of ibises (Threskionithidae) in Australia. R. Carrick. *CSIRO Wildlife Research*, 1962, **7**, 71-88.