

water pumped from nearby farmland at that time, and its water level fluctuated less than in Boggy Pond. Its water would also have been more nutrient-rich, and certainly the raupo and willows of Boggy Pond are now more similar in size and vigour to those of Matthews Lagoon. Sedges which thrive in high nutrient waters, such as the tall summer-green *Bolboschoneus fluviatilis*, soft grassy *Carex maorica* and tall spike rush were in Matthews Lagoon only, but in March 1989 I found a bed of *B. fluviatilis* on the edge of Wader Pond nearest the cut in the stop-bank. Introduced Mercer grass now appears to be spreading in the habitat of the native *Amphibromus*, and pillwort has not been seen for several years. A range of wading birds such as seen in 1983 has not been seen since.

The end result of this attempt to enhance Boggy Pond for waterfowl shooting was a

without bird usage.

## Ephemeral wetlands on pumice

Central North Island "frost flats" can contain ephemeral wetlands, but they show why it can be difficult to classify communities as "wetland" or "dryland". The few frost flats that have native vegetation remaining after extensive exotic pine plantings and pastoral farming are characteristically covered by low heath scrub or short tussocks. Native forest species are absent, or are very slow to occupy the sites for a number of reasons.

The micro-climate of the broad flats or basin-shaped surfaces is frosty because of cold air ponding, the areas are drought-prone and have a history of fires, and the soils are often of low fertility. Although Taupo pumice in the soil is excessively free-draining, other less permeable tephra deposits and buried soils

Nature conservation tends to fare badly in competing interests for use of wetlands, and especially of those that are not permanently wet. The important first step in the conservation of ephemeral wetlands is to recognise their existence. This should be followed by recording their flora and fauna, in all seasons, and mapping to achieve an understanding of what changes are happening. Their dynamics can be better appreciated by study of earlier maps and aerial photographs, and talking with landowners and others with long-term local knowledge.

**Management:** In the past, formal reservation of ephemeral wetlands has not always led to their protection. No attempt should be made to "improve" an ephemeral wetland which has natural values until the possible consequences of change have been considered. Biologists from a range of disciplines should be consulted, as well as people with local knowledge. A primary aim of wetland management should be to retain and, where necessary, enhance, natural diversity. This applies as much to ephemeral wetlands as other types.

It must be understood that there are risks in deliberately modifying a wetland. As an example, disturbance of the native vegetation and substrate by livestock or vehicles allows the entry of weeds. Once weeds are established it can be very difficult to eradicate them, and restoration of the natural condition is likely to require much more than merely fencing to exclude animals or vehicles. In certain circumstances, controlled grazing may be necessary to suppress weed growth. Carefully designed experiments and monitoring should be part of every attempt to manage disturbed wetlands, and the results made widely known to wetland managers.



An ephemeral wetland on a terrace above Awapatu River, a tributary of the upper Moawhango River. *Amphibromus fluitans* occurs here, and it is also the only North Island site for *Gnaphalium ensifer*.

loss of wetland diversity; Boggy Pond became more like Matthews Lagoon in both its water regime and water quality and, as a result, in its flora and vegetation.

The shores of some inland lakes of Canterbury and Otago are similar to those at Lake Wairarapa. The only South Island record of *Amphibromus fluitans* was on the shore of Lake Tekapo in 1935, before the lake was raised for electricity generation.

## Ephemeral wetlands on glacial debris

Moraines and outwash gravel surfaces resulting from glaciation contain yet other types of ephemeral wetlands. These deserve more specific survey and recognition than they have received in the parts of the PNA programme. The 1984 PNA survey report on Mackenzie Ecological Region called these "kettlehole tarns", or simply "tarns" and identified them almost entirely as waterbird habitat, especially for black stilts. Where their ephemeral character was mentioned at all, the seasonal absence of water was, by implication, a blemish on their biological importance. However, native turf communities on the tarn beds are distinctive enough to warrant protection, with or

can impede drainage for shorter or longer periods. Areas with hard tussock and monoa (*Dracophyllum subulatum*), which are wet underfoot only during heavy rain, seem to be undoubted drylands, but these grade into progressively wetter areas with wetland species such as the sedges *Schoenus pauciflorus* and *Baumea* spp., tanglefern (*Gleichenia dicarpa*), a shrub daisy *Olearia virgata*, and bog pine. Between these extremes of dry and wet sites are those which are wet for some weeks or months – the truly ephemeral wetlands.

Mark Smale of FRI has recently pointed out that the natural character of frost flats is threatened by the spread of lodgepole pine (*Pinus contorta*) and mouse-ear hawkweed. In similar habitats in Tongariro Forest, heather (*Calluna vulgaris*) is another invader.

## Conservation needs

**Identification:** People do not generally appreciate the ecological importance and distinctiveness of ephemeral wetlands, their national rarity, their great range of types, their dynamic nature and their vulnerability to disturbance. Even PNA survey has sometimes failed to identify them or at least to distinguish their special qualities.



Ephemeral pond, Boggy Pond Reserve, Lake Wairarapa. The area is the habitat of the regionally uncommon plants such as the pillwort (*Pilularia novae-zealandiae*) and *Pratia perpusilla*; and temporary habitat for wading birds when water is shallow, including rare migratory species such as lesser yellowlegs and pectoral sandpiper, and the endemic wrybill.

## Acknowledgements

My special thanks to Tony Druce and Geoff Rogers for field discussions in many of the sites discussed above, and for their valuable comments on a draft of this script. My thanks also to others who commented on the script, including Department of Conservation staff Brian Patrick, Susan Timmins, Don Ravine, Hugh Robertson and Jan Heine.

Colin Ogle is a botanist and conservancy advisory scientist with the Department of Conservation in Wanganui. 🐦