
# Management of shallow freshwater Wetlands for Wildlife

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This Note briefly considers the management issues associated with maintaining the natural values of small semi-permanent wetlands on private land, however, much of the information is also relevant to other wetlands.

Other *Land for Wildlife* Notes on related topics are Note 15 'Wildlife and farm dams', which provides information on the management of small artificial wetlands, and Note 22 'Whole Farm Planning and wildlife'. Further information can be gained from the references listed at the end of the text.

It is important to recognise that, whilst many of the larger wetlands are in public ownership the smaller, more numerous, often seasonal, wetlands are mostly privately owned. Many of these have been drained or altered from their natural state. Shallow wetlands provide wildlife habitat that differs from that provided by deep permanent wetlands.

## What are the wildlife values of shallow wetlands?

Seasonal drying imposes particular conditions on the plants and animals which are resident in shallow wetlands and means that larger wildlife species are only visitors, although they may breed. The vegetation is dominated by annual species or species which use bulbs or fleshy roots to survive drying. Invertebrate species have resistant eggs or lie dormant in the substrate, as do most frogs. Without connections to permanent water, fish are usually absent.

When flooded by winter rains, nutrients released from plant material, broken down over summer or by inundation, stimulate plant and invertebrate growth and breeding of frogs. Birds which have adapted to exploit these conditions include Black Duck and Grey Teal which eat both plant material and invertebrates, and Black-winged Stilt, ibises and White-faced Heron which eat invertebrates.

Shallow wetlands offer respite to tadpoles from predators, such as fish, that inhabit more permanent waters. Reptiles and amphibians associated with wetlands have a fixed dependence on the wetland, year round, in contrast to most birds. Carpet Snakes, which have declined in Victoria, take refuge in the live and dead River Red Gums and Black Box associated with wetlands in northern Victoria.

Shallow wetlands are important breeding habitat for many water birds. Some species both nest and raise their young (e.g. Black Swan, Black-winged Stilts, Brolga and Purple Swamphen) at shallow wetlands. The amount of vegetation remaining from the previous inundation, together with new growth, is important in determining how long after flooding these species will nest, as large amounts of material are used by some species for nest construction (e.g. swans) while others build their nest above the water in emergent vegetation (e.g. swamphens). Other waterbirds nest nearby in tree hollows (e.g. Australian Shelduck, Maned Duck) or dense vegetation (e.g. Black Duck, Australasian Shoveler) and newly-hatched young move to the wetland. Again, the amount of vegetation is important because it provides protection from predation for young birds as well as food.

It should be remembered that some species which nest on more permanent wetlands (e.g. Great Egret, Little Pied Cormorant, Rufous Night Heron, Yellow-billed Spoonbill) or, indeed, in trees away from water (e.g. White-faced Heron) rely on seasonally-inundated wetlands for food which they may carry for many kilometres back to feed their young.

Where vegetation is sparse or low along the shoreline, Black-fronted Plovers and Red-kneed Dotterels nest on the ground and migratory waders (e.g. Sharp-tailed Sandpiper, Latham's Snipe), which do not breed in Australia, may be seen feeding.

## Are there other values?

Wetlands may provide landholders with a wide range of other benefits including improved water quality (due to natural filtration), flood mitigation, erosion protection, nature conservation, study and education, recreation (bird-watching, duck-hunting, fishing), tourism, nutrient cycling/pollution control, landscape values, control of pasture pests by wetland birds, aquaculture opportunities and firebreaks (Oates, 1993; DCE & OOE, 1992). Farmers recognise wetlands as a valuable source of water (for stock and fire protection) and as a source of 'green-pick' in summer. Wetlands are also used for eel and yabby farming (with appropriate CNR permits).

## Threats

Briefly, the processes which may threaten wetlands are: drainage, dredging and land-filling, some agricultural practices (particularly cropping and inappropriate grazing regimes), water supply and regulation, salination, soil erosion and sedimentation, clearing, waste assimilation and nutrient input, plant and animal pests, some forestry practices (especially those resulting in siltation), over-

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fishing, excessive recreational use, fire and activities associated with mining and extractive industries.

While some of the threats to wetlands can be tackled on an individual property, many require a group approach to obtain changes in the whole catchment.

## Wetland diversity

There are a great variety of natural wetland types in Victoria. Variation in landscape position, geology, salinity, depth, size and vegetation are some of the attributes that contribute to this diversity. There can be large variation across relatively short distances. Wetlands also vary in their management history and degree of degradation. It is therefore difficult to provide prescriptions that will cover the great range of wetlands encountered across Victoria. The following management considerations are applicable to a wide range of wetlands and should be used as a guide only to the potential issues and management solutions that may be applied in specific instances.

## Management considerations

The overall aim of wetland management for wildlife is to promote a natural system in which natural processes operate and in which the elements necessary to sustain life (soil, water and nutrients), are maintained in a healthy state.

### *Planning*

Planning is essential if the full potential value of the wetland is to be attained (refer to Note 22 Whole Farm Planning). The first step in managing wetlands on a property is to prepare a management plan that considers your aims, issues and management actions.

Since individual wetlands are part of the broader landscape, which could include other wetlands, hollow-bearing trees and extensive catchment areas, it may be necessary (and is advisable) to work in unison with other landholders to protect the wetland catchment. A network of wetlands throughout the area will usually have higher wildlife value than one isolated wetland. Several small wetlands are likely to support a greater variety and number of species than a single wetland. The Victorian Wetlands Database (CNR) may be able to assist in locating wetlands in your area and aerial photos can also be used.

The plan should allow for buffer zones around wetlands to protect the wetland against outside disturbances and address issues such as fencing, grazing regimes, weed control, tree planting and impacts of other activities (e.g. sedimentation following cultivation in the catchment, fertilizer or spray drift, etc.).

In most areas of management, a passive approach, allowing natural processes to 'manage' the wetland, is usually preferable to intervention. Careful prior investigation of the potential consequences of active management is essential.

In the following text, potential management actions are shown in boxes.

### *Water level*

Natural fluctuations in water level are a feature of all wetlands and, for shallow wetlands, are responsible for the dramatic seasonal changes which occur. The timing (season), duration and frequency of water level changes are all important in determining the nature of the wetland. Remember that it may be normal for a shallow wetland to contain no water for up to six months of each year .

A drop in water level may influence flowering and seed set or offer opportunities for regeneration. Differences in the depth of water, frequency and time of immersion influence what plant communities are present and the area they occupy. Water depth influences the availability of food, some species being able to exploit foods at greater depths (e.g. swans can eat aquatic vegetation to the depth of their neck length whilst Blue-billed Duck will dive for food). Periodic floods may control invasive plants (native and introduced), bring earthworms to the surface (providing a food supply) or allow fish and other aquatic life to take advantage of newly-inundated areas. Nest sites may be flooded and breeding affected. Wetland animals take advantage of food sources released by rising water levels. Breeding cycles may be activated by water level changes. Unnatural fluctuations may disrupt any of these processes.

Drying enhances decomposition of plant material contained in the wetland and encourages high productivity of vegetation and animals when the wetland refills with water. Some invertebrates require drying and reflooding for reproduction.

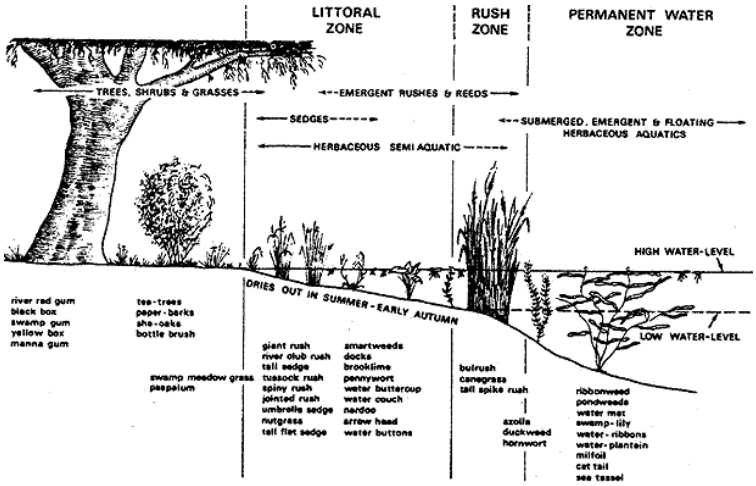
Longer periods of inundation do not necessarily improve wetland values and can be harmful. For example, if inundation lasts more than 12 months, productivity will be lower in the second year. River Red Gum (*Eucalyptus camaldulensis*) and Black Box (*E. largiflorens*) may be killed by more than four years continuous flooding (Briggs, 1988).

A natural regime of water level fluctuations is usually the appropriate aim of management. In south-eastern Australia, temporary wetlands are usually dry in summer and refill in winter or spring, however, considerable annual variation occurs, depending on rainfall patterns. Wetlands that have been drained can be restored by blocking the drain with suitable material which may include an outlet device/regulator (if some degree of continued water level control is required). Attention may have to be given to the sources of water in the wetland catchment if the natural regime is to be reinstated. In most instances, the zonation patterns of natural wetland vegetation can be used as a guide to the extent and duration of wetland flooding. For example, River Red Gums, reeds and sedges fringe many Victorian wetlands and represent the outermost margin that is above water at most times. Low herbs or floating-leaved plants may occupy the zone that undergoes regular fluctuations and submerged plants, such as stoneworts and water milfoils, the deeper sections that are rarely dry. Of course, deeper sections are often not present in shallow seasonal wetlands so species sensitive to prolonged inundation (e.g. River Red Gums) may occur throughout. Refer to DCE & OOE, (1992b) for a method of determining wetland boundaries.

.Briggs (1988) comments that wetlands need to remain flooded for at least 4-6 months in the year to allow for successful reproduction of waterbirds. This reproductive sequence involves pair formation, nest construction, incubation, brood rearing and fledging of young.

Seed-bearing plants, when flooded in autumn, may attract large flocks of waterbirds, especially ducks. Rice growers often (unintentionally) create excellent habitat for ducks which can cause extensive damage to the crop.




*The extent and duration of wetland flooding is indicated by the distribution of wetland species*

### *Water turbidity & sedimentation*

Water quality is affected by human activities within the wetland catchment and by natural events such as storms, wind and rainfall.

Water turbidity influences the efficiency of visual predators and can change the nature of the bottom vegetation and food sources for wildlife.

Sedimentation of the wetland reduces its volume, can smother plants and affect animals (e.g. cover fish spawning sites) and reduce light penetration. Nutrients and toxins bound to sediments washed into the wetland may affect plant and animal populations.

Establishment of a suitable level of plant cover in the wetland catchment, and particularly around the wetland, will limit erosion as a source of sediment. Leaf litter is also beneficial in reducing the impact of rainfall as a cause of erosion. Reducing the stocking rate or changing the pasture composition may be necessary. Soil disturbance should be avoided, particularly near to the wetland. Disturbance by livestock can be avoided through fencing or de-stocking during sensitive periods (especially whenever soils are soft). A sediment trap, consisting of a well-vegetated depression, can be installed above the wetland, if this will not interfere with other values.

### *Salinization*

Salinization of the wetland may occur with changes in catchment hydrology. Changing salinity levels have dramatic effects on plant and animal life with salt-intolerant species disappearing and being replaced by salt-tolerant species.

Within the catchment, revegetation of groundwater re-charge areas will help to control or prevent salinization of wetlands. Salinity Plans are available for most catchments. Enquire at your nearest CNR office or library about opportunities to inspect local salinity plans.

Private companies offer water-quality monitoring services, if required. Your local CNR office may be able to offer advice on local contacts.

### *Wave action*

Wave action can affect the shoreline profile (and hence plant communities), and may lead to erosion of banks and siltation. Wave action is most noticeable in permanent wetlands with a large surface area.

Control is achieved by establishing binding native vegetation along the shoreline. Reducing grazing levels to retain vegetation cover in dry periods is also very useful.

### *Light and temperature*

Light is required for plant growth. Temperature influences the amount of dissolved oxygen which, in turn, influences the rate of plant decomposition and the activity of wetland lifeforms. High light penetration, suitable nutrient loads, calm water and warm temperatures favour algal blooms which can be toxic and, in any case, reduce light available to submerged plants. Shade from trees affects the distribution of annual plants in the wetland and can reduce water temperature. For example, water temperature affects physiological processes such as spawning, hatching, feeding, growth and migration of fish.

Use local natural wetlands as a guide for planting. Avoid creating conditions favourable to blue-green 'algae', by paying attention to the input of nutrients to the wetland, especially sources of nitrogen and phosphorus (see *Land for Wildlife News* Vol. 2, No. 2, p 3). The Aquatic Botany Group, Environmental Assessment Section, State Water Laboratory of Victoria, 590 Orrong Road, Armadale, 3143 (tel: 03-508 2666) can assist with identification and management of blue-greens.

### *Nutrients/toxins*

Changes in the level of nutrients can have a major impact on the plant community and significant increases can eliminate plants that are adapted to low levels of nutrients or that are shaded by the increased phytoplankton growth. Excessive plant growth leads to lower water movement and reduced dissolved oxygen which is required by aquatic life. Nutrient changes may favour exotic plants which can displace native species and so change the nature of the wetland.

Chemicals may be harmful to aquatic life: fish may be killed by chemicals such as ammonia, pesticides and phenols and crustaceans by copper from fungicide sprays. Human consumption of fish may be dangerous, as a result of accumulated toxins.

Sources of nutrients include fertilizer, manure, sediment and effluent (e.g. from dairies, leaking septic tanks, some household detergents or old garbage dumps). Nutrient levels may change naturally, for example, as a result of colonisation by a flock of birds. Toxins may be used for agricultural, other commercial or household purposes on the property or further afield. Extreme events, such as floods, must be considered in planning for effective protection of the wetland, as these may cause nutrients or toxins to be mobilised.

Carefully consider fertilizer input to pastures (close to wetlands), create a buffer zone of dense low plant cover (local native reeds, sedges, grasses) surrounding the wetland, manage grazing and promote natural recycling of stock faeces in pasture. Avoid the use of toxic chemicals wherever possible, use according to manufacturer's instructions and return unused portions to approved

disposal agents (your council will probably be able to advise of the procedure in your area).

### *Problem plants/animals*

Some 149 environmental weeds of herb-dominated freshwater wetlands and 42 of shrub-dominated freshwater wetlands have been identified (Carr et al, 1992). Environmental weeds affect the vegetation of wetlands and this affects animal communities (Carr et al, 1992; Loyn & French, 1991). For example, native wetland plants can be displaced by introduced competitors.

Prevent or reduce the rate of weed invasion by reducing the level of disturbance to soils and plant communities (e.g. cultivation, livestock, vehicular movement), excessive fires and frequent unnatural flooding or drying regimes. Avoid introducing sources of weed seeds (e.g. livestock feed cut from wetlands that contain weeds). Reduce the 'edge' between wetland and other land use by increasing the buffer area around the wetland and keeping vehicle tracks well away (20 metres) from wetland margins.

Fire, flooding and digging by native animals are examples of natural forms of disturbance that may favour weed invasion. It is generally not advisable to alter these natural processes in order to attempt control. Flooding may exclude plant species that might otherwise invade the wetland.

Many chemical weedicides are unsuitable for use near wetlands as they are transported by water and can easily enter the food chain. Frogs, fish and invertebrates are particularly vulnerable to chemicals.

Avoid the use of chemical controls near wetlands and follow manufacturer's instructions carefully to avoid contamination of wetland areas. Alternative techniques include manual removal, mowing, overlay and overplanting (see LFW News Vol. 1, No. 10).

Wetlands that are fenced and providing cover for native animals may also provide habitat for unwanted species such as rabbits and foxes.

A vermin control program for the wetland should be incorporated into the management plan for vermin throughout the property/area (*refer to Land for Wildlife* Note 24 - Foxes - options for control in wildlife habitat, *Land for Wildlife News* Vol.1 No. 8 p 5, Vol. 2, No. 2, p3).

Swamp Rats may occupy dense vegetation around wetland margins and can be responsible for chewing bark of young trees and shrubs (especially in late winter).

Modifying the habitat by keeping long grass off the site (by mowing, limited grazing) during establishment of the plantation can prevent this problem (Temby 1992).

### *Grazing & trampling*

Grazing by native herbivores is a natural process in many wetland types and may be necessary to maintain diversity. Overgrazing is damaging to wetlands. Some wetlands, such as alpine bogs and tidal marshes do not tolerate any grazing by livestock without sustaining damage.

Grazing may damage wetlands by changing vegetation, soil and hydrological processes. Livestock can selectively graze palatable species, trample plants, pugg soils, increase nutrient levels through addition of faeces, advantage weeds through soil disturbance and remove seed-heads and flowers. Weed seeds can be introduced with stock feed or with faeces. Vegetation needed for nesting and cover from predators may be removed. On the other hand, well-managed grazing can maintain open areas preferred by some waterfowl and reduce the dominance of some prolific plant species, allowing others to survive.

The impact of grazing will vary according to the timing (season and duration) and the type of stock. Cattle readily enter water to graze emergent plants; however sheep are less likely to enter water, cannot graze in deep water and are less likely to be grazed on wet sites due to the dangers of contracting footrot or liver fluke. The stocking rate, the plant community being grazed, the presence and numbers of native and exotic grazers and prevailing climatic conditions also play a part in determining the impact of grazing.

Grazing should be managed to minimise damage by restricting access to all or part of the wetland (particularly in areas with sensitive or rare species) using appropriate fencing. Alternatively, if cessation of grazing is not possible, restrict the duration, timing and number of livestock to a level where wetland values are maintained and damage minimised. The period when soils are dry, seeds have fallen and breeding is absent may be suitable for grazing. The exact number of stock that can be grazed and the impact they will have on different wetland types can only be determined by experiment and observation. It is better to underestimate the number of stock than overestimate. Pigs and goats are destructive feeders and should not be permitted access to wetlands. Where livestock access is prevented, and the wetland was used for livestock watering, then water might be pumped or siphoned to a trough. If limited access to the wetland is permitted then the effect of livestock on this reduced area will increase if livestock numbers are not reduced. Gravel ramps may need to be built at access points to avoid damage. Access for native animals must also be taken into account. Standard cattle and sheep fences will not prevent access by kangaroos and their relatives (qv LFW Note 29).

### *Fire*

Fire can be a frequent event in wetlands (CNR, 1993). Seasonal wetlands may dry out sufficiently during summer to burn. Many of the plants in these wetlands are adapted to survive fire by such means as re-shooting from underground rootstocks or rapid re-colonisation from soil-stored seed. Wetlands that rarely dry out may be damaged by fire. Unseasonal fires can be harmful to wetland plants and animals. Fire can be particularly damaging to wetlands on peaty soils as the peat, if sufficiently dry, can be consumed by the fire. Fire can remove food, nesting materials and cover needed to shelter from predators. Ash from fire may contribute a substantial quantity of nutrients to the wetland. Following fire, sedimentation may increase along with water temperature, as a result of less vegetation cover. Frequent fires may favour weed invasions. Fire may increase wetland plant diversity by reducing the dominance of vigorous species.

As a management tool, fire may be used to remove dense above-ground vegetation from an area of a wetland for re-vegetation purposes. Department of Conservation and Natural Resources' staff may be consulted about the safe use of fire for vegetation management and if, and when, it should be used. If fire is used, always allow room for errors and insufficient knowledge by burning only a portion of the wetland at any one time and, of course, always take note of fire restrictions.

Soil disturbance, changes to surface drainage and loss of vegetation cover should be minimised by limiting the

extent of the fire and, as far as possible, limiting vehicle movement to outside the wetland boundary.

If a firebreak is considered necessary, it should be situated at least 20 metres from the wetland and preferably in an area that does not affect native vegetation. Strip grazing, as a means of creating a firebreak, is preferable to cultivation (CNR, 1993).

### *Vehicle access*

Vehicles should avoid wetlands, particularly whenever the soil is damp.

### *Vegetation*

The wildlife values of shallow wetlands have been discussed previously in this Note. Wildlife is dependent on the type and quality of vegetation.

Aim to create a natural diversity of plant species and wildlife habitats. As a general rule, use local wetlands, in natural condition and of similar type, as a guide to wetland management and what to plant, being careful to identify each species beforehand to ensure it is native and not a potential problem

A greater diversity of habitats will maximise the diversity of wildlife species. Size, diversity of marginal and submerged vegetation, irregularity of edges, variation in the rate of water flow and the extent of open water are some of the variables that add to the diversity of wetlands.

Transplanting and establishment from seed are simple, effective and cheap means of revegetating a wetland if native plants have disappeared. Plants will also establish from propagules washed into the wetland or brought in on the body of waterbirds. The references given at the end of this Note may assist with species identification. Some nurseries specialise in wetland plants and may be willing to propagate local seeds or cuttings that you collect (Ask a *Land for Wildlife* extension officer for contacts).

## Monitoring

Monitoring the health of the wetland can provide valuable management information. Simple sampling techniques can be used to provide information on a range of variables. Others may require expert analysis.

Indicators of water quality include turbidity, suspended solids, conductivity, pH and nutrients. Biological indicators such as macroinvertebrates, fish, birds, vegetation and rare species can also be monitored to obtain information on the health of the wetland. If you intend to monitor a wetland yourself, it is wise to seek advice initially about setting up standards and consistency.

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