

New South Wales



Managing wetlands on your property

GUIDELINES for inland New South Wales



ADDING VALUE TO THE NATURAL ASSETS OF NEW SOUTH WALES

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Introduction

1.1 A vital resource

There are many benefits to managing wetlands on rural properties. They are a vital resource for achieving sustainable production and for safeguarding the health of your property and the local environment.

A recent global study estimated that the world's natural ecosystems are worth US\$33 trillion. Of this, wetlands are thought to be worth US\$14.9 million, or 45% of the total (Ramsar Bureau 2000). The services, functions and values provided by wetlands are good reasons for protecting them through proper management.

These Guidelines provide a “wise use” approach to managing wetlands. They were written with a focus on the management of small to medium-sized wetlands in inland New South Wales.

1.2 Wetland management

The Guidelines describe the process of developing a management plan for your wetland areas in four steps.

We also offer some tips along the way to assist you at each stage of the process, as well as describing case studies that show how others have managed their wetlands.

Finally, we provide some useful websites for those who have access to the internet.

The process outlined below (adapted from the Hawkesbury-Nepean Management Trust 1996) is flexible; the period of time over which you carry out the steps depends on you and the time you have available.

1.3 Resource Folder

The Resource Folder that accompanies these guidelines contains a large amount of helpful information on:

- wetland values,
- relevant legislation and policies,
- a variety of management strategies,
- potential funding sources, and
- lists of contacts for further information.

You may find it useful to keep it handy as a reference when you read through this document.

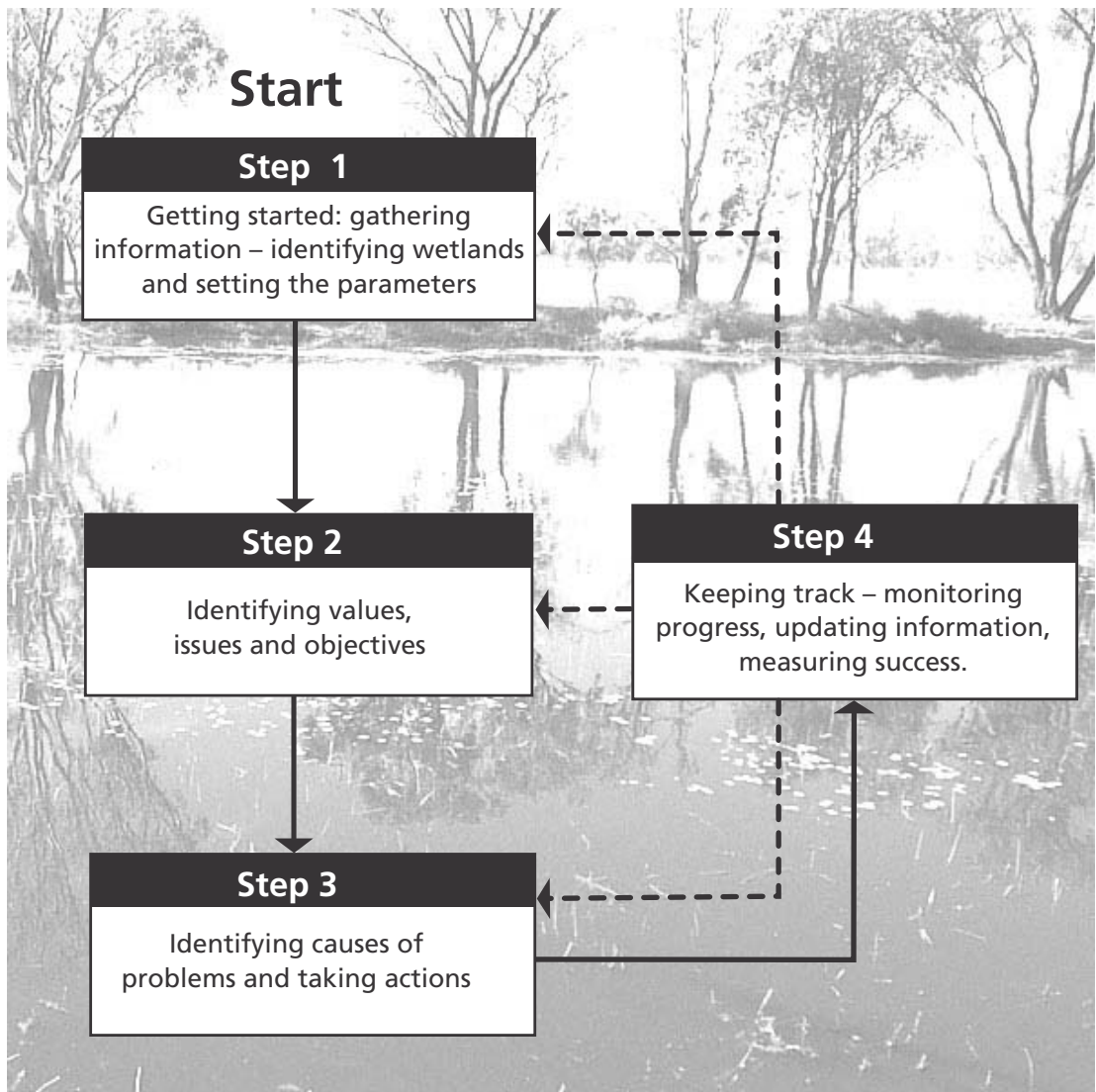


Figure 1 How to develop a plan of management for your wetland

This diagram shows in graphic form the steps needed for developing a plan of management for your wetlands. In the following sections, we will help you along the way with information and advice for each step indicated in this diagram.

To begin working on your plan of management, you commence by identifying and mapping the wetland or wetlands on your property, distinguishing them in role and function from the dams on your property, and understanding who is involved when wetlands cross property boundaries.

Thorough information collection is a very important component of this first stage.

In the second stage, having set the parameters of your wetland in Step 1, you will identify the values, issues and objectives related to your wetlands – what uses your wetland offers, what factors are affecting your wetland, and what objectives you wish to achieve in the management of your wetland.

In Step 3, you will identify the causes of problems in your wetland and what actions you wish to take to alleviate the problems. At this stage you will also need to identify what legislative and planning requirements are in place, what your best management strategies and options are in the light of these, and what funding sources are available to you.

In the last stage, Step 4, you will constantly monitor your progress (as represented by the arrows with broken lines) by observing your wetland for changes, updating your information sources, continuously re-assessing the values, issues and objectives of your wetland, and measuring the success of your actions against your objectives.



Step 1 – Getting started

2.1 Identifying wetlands on your property

Although there are many different definitions of wetlands, under the NSW Wetlands Management Policy they are defined as land that is inundated permanently or temporarily with water that is usually shallow, slow moving or stationary. Wetlands can be fresh, saline or brackish. The inundation determines the type and productivity of the soils and the plant and animal communities living in them¹ (NSW Government 1996).

So how do wetlands differ from dams? Dams are artificial structures, and are usually deeper bodies of water built with steep sides primarily for water storage. As a result of this, the vegetation in and around dams is usually different from that of wetlands.

Wetlands are linked to the rest of the catchment via surface water and groundwater. Some wetlands are visibly linked at the surface, forming wetland complexes that cover a number of properties. Aerial photographs will reveal whether or not this is the case. If they are linked, cooperation with your neighbours will be crucial to the success of locating and managing these wetlands.

Identifying wetland on your property

- Identify the boundary of the wetland on a property map (or on a clear plastic overlay). Ask your local DLWC office or land information centre for an aerial photo to help you to do this. It can be useful to get a map or photo for each of the seasons.
- Note whether or not your wetland is part of a larger complex of wetlands in the catchment.

Wetlands in NSW have been mapped by the NSW National Parks and Wildlife Service (for the Murray-Darling Basin), Department of Land and Water Conservation and the Murray-Darling Basin Commission.

Maps are available from your local DLWC or NPWS office or the Murray-Darling Basin Commission. Office contact details are listed in Section 9.1 of the Resource Folder (page 29).



Photo courtesy of Dr. Surry Jacobs, Royal Botanic Gardens

¹ Note that many of the principles that apply to naturally occurring wetlands also apply to artificial wetlands. However, those are dealt with in greater detail in other publications such as the *Constructed Wetlands Manual* (DLWC 1998). This document addresses only natural wetlands.

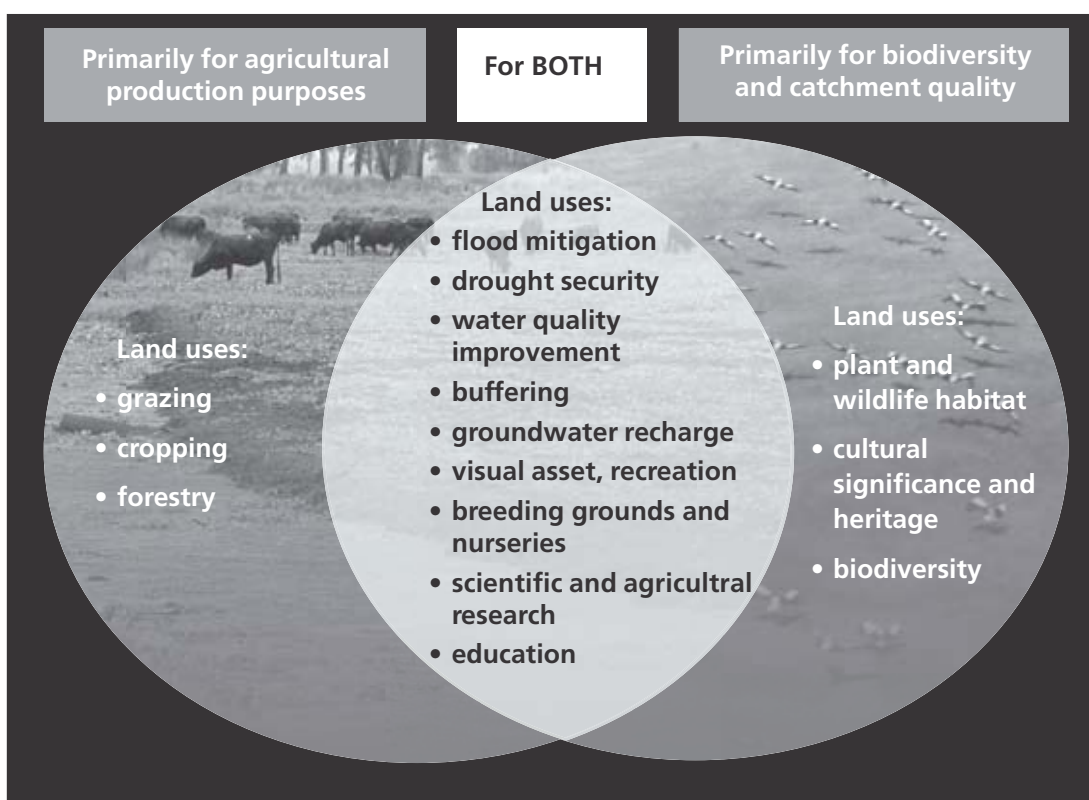
2.2 Wetland services

The diagram on this page summarises some of the important functions of wetlands and how they provide a resource for agricultural or production purposes, as well as biodiversity/catchment quality.

What benefit or value does your wetland have?

- Create a list of benefits your wetland provides (see the diagram below for some ideas). This will be useful in STEP 2 for identifying what wetland services you want to manage.
-

Figure 2 Wetland functions



2.3 Setting the parameters

2.3.1 Who's involved?

If the wetlands on your property are shared with adjacent properties, it is essential to treat them as a single complex so that you can get the best management outcomes. Your wetlands are part of a catchment and are therefore influenced by activities occurring across the catchment.

Who's involved?

- If the wetland crosses property boundaries, identify the other people in your local area, such as neighbours, who are likely to have some connection with the wetland and speak to them about it.
 - Make a note of any benefits they identify and add these to your list.
 - Also make a note of any concerns others may have about the health of the wetland, and any general information they can provide you with.
-

2.3.2 What do I already know?

Take a look at the questions below and think about what you already know. Space is available in the following pages to make a note of this information.

What do I already know about my wetland?

- How often is there water in the wetland?
 - How long does the water stay?
 - What is the main source of water?
 - Where does it appear to enter from and where does it exit? Does the water terminate in the wetland or flow through?
 - How have the flows changed over time?
 - How close is the wetland to a river? Another wetland?
 - What structures, such as weirs and regulators, affect the flow?
 - How much water is required for a healthy wetland?
 - How often is there rainfall? How quickly does water evaporate from the wetland?
 - What is the soil type in and around the wetland? Are there any acid soils? Are there any salinity problems?
 - Are there plants in and around the wetland?
 - What eats the plants – sheep/cattle/native animals?
 - What colour is the water? Is it cloudy or clear? Is there ever a “scum” on the surface?
 - What does the wetland smell like? Is it a strong smell and is it always there or just when the water level is low?
 - Is the wetland disturbed by machinery?
 - Do birds come to the wetland to feed? To nest? To breed?
 - Are there fish or frogs in the wetland?
-

2.4 Information gathering

Collect information on each of the topics below. The material contained in Section 2 “Information Sources” of the Resource Folder (page 2) may be of help to you at this point.

2.4.1 Current uses

Using the table provided over the page, make notes on the current use of wetlands on your property and in the catchment. Some issues you may like to consider when filling in this table are:

- Who are the local stakeholders and which are the impacted properties?
- Is machinery disturbing the wetland?
- What are the most common uses of land in your catchment?
- What types of land uses occur upstream of your wetland?

Current uses

On your property

.....

.....

.....

In your catchment

.....

.....

.....

2.4.2 Historical value/uses

How much has your property and the catchment changed over time? Take into account changes in flow patterns, construction of weirs, dams, levees etc, flood events, draining, filling, bushfires and droughts.

Historical value/uses

On your property

.....

.....

In your catchment

.....

2.4.3 Biological condition

Answer the following questions to find out the biological condition of your wetland.

Biological condition

What lives in your wetland?

.....

Does anything eat the plants – sheep/cattle/native animals?*

.....

Do birds come to the wetland to feed? To nest? To breed?

.....

Are there fish or frogs in your wetland?

.....

*See Information Collection Sheets for Plants and Animals on the following pages. You will find a list of Field Guides in Section 7 of the Resource Folder (page 26).

2.4.4 Climate and geology

Ask yourself the following questions to ascertain the local climate and geology.

Climate and geology	
Average rainfall; rate of evaporation	
Seasonal rainfall patterns	
How quickly does water evaporate from the wetland?	
What is the soil type in and around the wetland?	
Are there any acid soils?	
Any salinity problems?	
Local temperature information	

2.4.5 Hydrology

Ask yourself the following questions to ascertain the water flow and wetland hydrology.

Water flow and wetland hydrology	
How much water is required for a healthy wetland?	
How often is there water in the wetland?	
How much does the water level fluctuate?	
What structures affect flow?	
How long does the water stay?	
What is the main source of water?	
Where does it appear to enter from and where does it exit?	
Does the water terminate in the wetland or flow through?	
How have the flows changed over time?	
How close is the wetland to a river? To another wetland?	
What structures, such as weirs and regulators, affect the flow?	

2.4.6 Water quality

Ask yourself the following questions to ascertain the water quality of your wetland.

Water quality	
What colour is the water in the wetland? Cloudy or clear?	
Is there surface scum or algae?	
Do you know what it is?	
Is there odour present? How often?	
What lies near the wetland or above it?	
Are there plants in or around the wetland?	What type?
Is anything lying dead in the water?	
Are there any records of fish kills?	



Step 2: Identify management issues and objectives

3.1 Wetland management issues

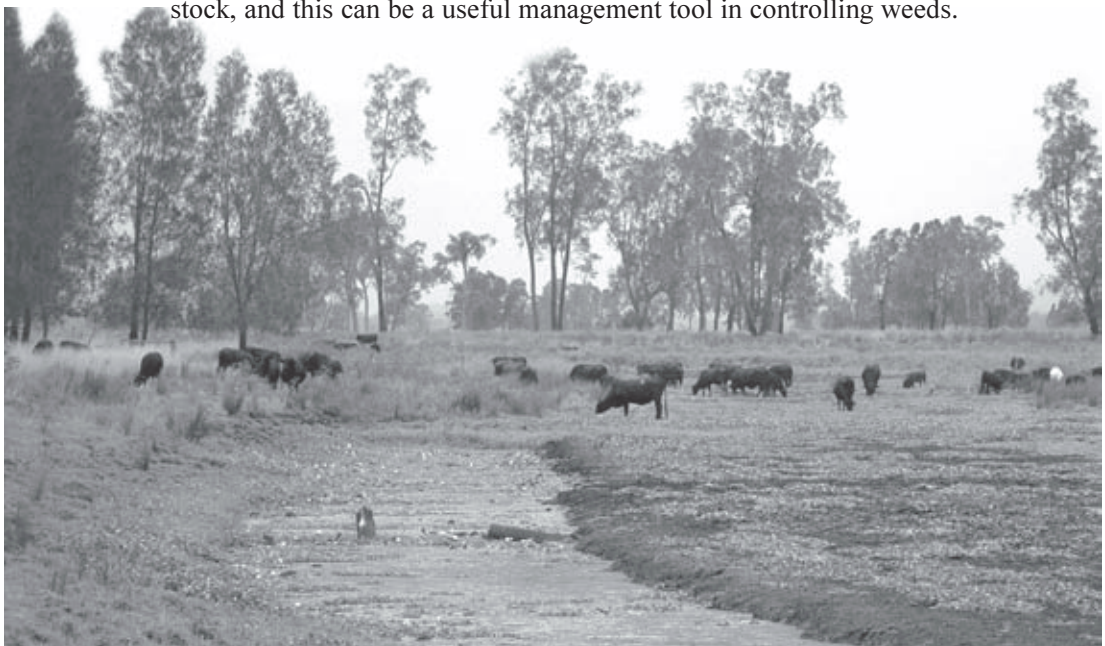
This section contains a brief description of some wetland management issues. Further information on managing these wetland management issues is available in the Resource Folder.

3.1.1 Dams for water storage

The water-holding capacity of a wetland can be a useful resource but wetlands can degrade when the natural water regime is changed. For example, the wetting and drying cycle that governs many wetlands enhances the breakdown of pollutants and organic material and the recycling of nutrients. For this reason, wetlands should not be used to permanently store water or water stock. Dams can be used for these purposes.

3.1.2 Grazing

Wetlands can be useful for grazing. However, grazing can affect a wetland in many ways, and over-grazing can degrade wetlands through trampling of vegetation, compacting and pugging of the soil, disturbing sediments, eroding banks and increasing nutrient levels. This creates poor water quality, which may lead to other problems such as weed infestation, problems with mosquito breeding and algal blooms. Grazing can considerably alter the types of plants in wetlands. Many animals generally avoid less palatable weedy plants, and eat many native plant species. Some weed species, however, are palatable to grazing stock, and this can be a useful management tool in controlling weeds.



Coraki wetlands, New South Wales

3.1.3 Cropping

Cropping can affect your wetland whether you are cropping the wetland itself or cropping areas around the wetland. The frequency of cultivation and cropping determines the degree to which soil nutrients, soil structure, native vegetation recolonisation and habitat presence are altered. Crop volumes also determine the magnitude of these impacts. The clearing of lakebed vegetation can result in a loss of plant diversity and may reduce animal habitat. Increased soil salinity may also occur due to the rising of water tables where vegetation is cleared. Sedimentation can also occur with cropping.

3.1.4 Timber harvesting

Harvestable timber on your property can be a useful resource, but over-clearing is a problem. In wetlands, birds and other animals use both living and dead trees for habitat. Vegetation cover also binds the soil, preventing erosion problems.

3.1.5 Aquaculture

Land-based aquaculture has an impact on water quality as it requires high protein feeds and can produce significant organic inputs from faeces and uneaten food. Aquaculture has the potential to degrade the aquatic environment depending on its location and extent, and the management and type of activities taking place.

3.1.6 Drainage

Drainage has been a major factor in the loss and degradation of wetlands. Usually occurring in order to create agricultural land for grazing and cultivation, drainage results in changes to the occurrence of plant and animal species. Aquatic species may be replaced by terrestrial species, which can lead to a loss of natural wetland functioning (e.g. water quality maintenance, flood mitigation).

3.1.7 Use of pesticides and fertilisers

Pesticides can degrade water quality and potentially harm aquatic life in and around the wetland. They also threaten the quality of groundwater where the receiving wetland is groundwater-fed. Pesticides can also upset the predator-prey balance in a wetland.

Nutrients from fertilisers can cause excessive plant growth. These plants eventually decay, depleting oxygen in the water and resulting in stagnation. Furthermore, fertilisers often encourage the proliferation of weeds at the expense of native plant species.

3.1.8 Water resources development

The impact of water resources development on wetlands varies greatly at both local and regional levels. Activities such as regulation, extraction and diversion result in changed flow regimes, poor water quality, habitat loss and fragmentation, erosion, sedimentation, salinity, cold water pollution, loss of biodiversity and obstructions to fish passage. The main factors causing changes to flows to wetlands usually involve reduction in catchment area, diversion and alteration of flows and harvesting runoff.

3.1.9 Water quality

Wetlands can assist in improving and maintaining water quality. However, wetlands are limited in their ability to assimilate nutrients and breakdown pollutants. Indications of degrading water quality include weed infestation, algal blooms, fish kills, pungent odours and general fouling. All of these problems threaten the integrity of the wetland and can pose a health risk to stock and humans.

Poor water quality in wetlands may be caused by stock, by pesticide and fertiliser use, and by cultivation and disposal of irrigation tailwater and drainage water. Furthermore, runoff from irrigation elsewhere in the catchment can have adverse impacts on wetlands.

3.1.10 Salinity

In some places, salinity is a natural phenomenon but in others, increasing salinity caused by rising water tables is often the result of particular land-use practices such as over-clearing, urban development, river regulation, irrigation or the cultivation of crops. Salinity from rising water tables is grouped into dryland, irrigation and urban salinity.

The degree to which increases in salinity affect plants and animals depends on the tolerance of each species. While some wetlands are naturally saline (such as salt lakes), highly saline waters can make it impossible for most wetland vegetation and fauna to survive, and these areas are difficult and costly to rehabilitate. Salinity levels in wetlands can change seasonally and throughout wetting and drying cycles.

3.1.11 Weeds

Weeds are often a catchment-wide problem, leading to poor water quality, a decrease in the number and variety of native plants, less nutritional feed for stock, unusable recreational areas, and blockage of drains, pipes and irrigation systems. They contribute to the disappearance of native animals that rely on native plants for food and habitat.



Salinity in an inland NSW wetland.

Photo courtesy of Dr. Ben Gawne, CSIRO

Nutrient enrichment (due to runoff, fertilisers, etc.) is often the cause of wetlands being choked by nuisance weed species such as azolla, water hyacinth (*Eichhornia crassipes*) and salvinia (*Salvinia molesta*). Alterations to flows can also support the spread of weeds by providing a water regime that supports the growth of problem species such as lippia (*Phyla canescens*), which thrives in floodplain and wetland areas subject to either frequent or occasional inundation.

3.1.12 Feral animals

The most common feral animal species in NSW are pigs, cats, foxes, rabbits and carp. Feral animals destroy native vegetation, compete with and prey on native species and contribute to problems such as erosion and sedimentation. In wetlands, introduced species such as carp pose a particularly serious problem. Carp disturb bottom sediments, often causing an increase in turbidity, which can prevent light penetration and threaten the survival of other fish (through competition for food), invertebrates and even native species. NSW Agriculture and Rural Lands Protection Boards can assist with the management of feral animals. See Section 9 of the Resource Folder for contact details (page 36).

3.1.13 Mosquitoes

Wetlands are aquatic habitats for a variety of vertebrate and invertebrate fauna. Among the vertebrate fauna, mosquitoes are of particular importance because they present a pest disease potential for nearby human communities. In south-eastern Australia there are approximately 120 known mosquito species, although probably less than 20 of these are of any concern as pests or carriers (vectors) of disease to humans.

The nature of a wetland, its form and vegetation, will determine to a great extent the nature of the mosquito fauna. Most mosquito-borne pest and disease problems depend on mosquito abundance, contact with humans and environmental factors such as temperature and humidity.

The hazard and risk from mosquitoes and pathogens can therefore be gauged to some extent by surveillance. Complete eradication of mosquitoes is neither possible nor desirable, but where wetlands remain healthy and are sustainably managed, mosquitoes are less likely to become a problem.

3.1.14 Fire

Fire is a part of the Australian environment and may be used as a management tool in some instances. The environmental effects of fire in wetlands are not fully understood and an appropriate fire regime should be used. Fire can create erosion problems, increasing sediments and nutrients in wetlands. Fire often results in changes to the vegetation, depending on the frequency and intensity of the fire.

3.1.15 Loss of biodiversity

Biodiversity is the variety of living things. The loss of biodiversity means that resource security may be diminished, and this can occur as a result of modifying the land for human purposes. Each of the management issues described here can potentially contribute to losses in biodiversity and so must be monitored carefully.

3.2 Identifying issues and objectives

Once you have gathered information about your wetland, identified its values and clarified which issues are most relevant to your wetland, you can then consider your objectives, or what you want to achieve.

Creating a Table of Values, Management Issues and Objectives

- List all the benefits you identified in STEP 1 under the “Value” heading in Table 1.
- List the Management Issues you wish to manage in the second column in Table 1 according to the value they apply to.
- Add your Objectives in the third column.

Table 1: Values, Issues and Objectives for Management

Value <i>Example</i>	Management Issue	Objectives
Grazing	Damage to vegetation, poor water quality,	Manage stock access to wetland to control erosion and maintain vegetation and water quality.



Step 3: Actions

4.1 Does action need to be taken?

Look at the information you have collected so far (how healthy is your wetland?) and your list of objectives (what do you want from it?) to decide whether or not action needs to be taken.

4.1.1 Passive management

If you decide to manage your wetland passively by deliberately avoiding certain activities in and around it, you may wish to create a list of these activities, by going directly to Step 4 “Keeping Track”. Read through the information and decide on the best way to check the progress of your management of the wetland.

4.1.2 Active management

If you decide that active management is required, prioritise your management objectives so that you tackle the most important ones first, to avoid wasting your resources later.

4.2 Identifying causes

Look at the “Management Issues” you have listed and prioritised in Table 1 (previous page) and identify the “Causes” for each, entering these into Tables 2 – 4 (page 19).

4.3 Identifying actions

The following considerations should be taken into account when you are deciding what actions to take.

4.3.1 Legislation and planning

Legal requirements relating to wetland management are included in Section 3 of the Resource Folder (page 4). This list includes the relevant Commonwealth and NSW State legislation and policies and international agreements. Use this information to decide which actions will be admissible and what other information you may need to collect in order to achieve your objectives.

4.3.2 Management strategies and options

Managing your wetland for just one of the values identified in STEP 1 would be difficult and is unlikely to be cost effective. The adoption of management strategies to address more than one issue allows you to manage your wetland as a multi-functional resource.

For example, fencing all or part of your wetland may satisfy a number of objectives such as preventing native vegetation loss, improving water quality and maintaining biodiversity because stock access to the wetland is limited. Management Strategies and Options are described in Section 4 of the Resource Folder (page 9).

4.3.3 Funding: what financial resources are available?

Funding and incentive programs can provide support for the initiation or continuation of wetland management. There is a range of financial and motivational incentives available to wetland managers at the national, state and local levels. These programs include government and non-government sponsored funding, taxation and rate relief options, trading schemes, voluntary agreements for management and international agreements.

Details on each of these programs can be found in Section 5 of the Resource Folder (page 22).

Wetland Rehabilitation: Native Dog Wetland Erosion Control and Revegetation

In 1998, the Native Dog Landcare Group commenced a program of restoration and rehabilitation of the Native Dog Wetland, an area of approximately 80 ha near Berrigan in south-western NSW. Revegetation was undertaken within 50 ha of the wetland with some 8 km of fencing. Most of the funding provided was used for erosion control, weed control, fencing and purchase of plant material. All labour was provided voluntarily.

This project was supported by the State Wetland Advisory Committee, Natural Heritage Trust, Greening Australia, Department of Land and Water Conservation, Berrigan Shire Council, Southern Riverina Field Naturalist Group, and individual landholders.

4.4 Listing your management issues, causes and actions

After assessing the matters raised in Section 4.3 “Identifying actions”, follow any necessary leads to the relevant legislation and its requirements, consider the various management strategies and options available to you, and research any funding avenues to be considered before you fill in the “Actions” column on the next page alongside the causes they are intended to address.

Table 2 (see below) provides an example of a management issue – sedimentation caused by vegetation loss – and identifies some actions that address the cause. Using this as a model, fill in the tables on the next page to identify your own management issues and the actions you will take to deal with them.

Photocopy the next page if you need more space.

Table 2: Example management issue: sedimentation

Causes	Actions
<i>Example</i> Vegetation loss	<ul style="list-style-type: none">• careful management of stocking levels• fencing to assist stock management• regeneration with native vegetation• buffer zone around wetland

4.5 Forming a management plan

- In preparing your management plan, create a table combining the Issues to be managed, your Aims/Objectives, and the Actions or activities you will undertake. Then allocate any available human and financial resources to these activities and set timeframes for each. See Table 5 below for a sample Management Plan that sets out each of these headings. Table 6 (next page) is provided for your use.
- To supplement your management plan table, use a clear plastic overlay on your property map to indicate the various management activities you will be undertaking eg. where to put fences, buffer zones, etc.

Table 5: Sample management plan for activities

Issues	Aims/ objectives	Actions	When and by whom?	Funding required? Source?
Poor water quality	Improve water quality; avoid algal blooms	<ol style="list-style-type: none"> 1. Exclude livestock from immediate environs of wetland – use fencing to manage. 2. Avoid/minimise use of fertilisers and pesticides. 3. Don't run irrigation tailwater or domestic waste directly into wetlands. 		
Weed infestation	Manage weed problem	<ol style="list-style-type: none"> 1. Manual weed removal for some weeds. 2. Minimise fertilisers entering wetland by minimising use on land surrounding wetland. 3. Have a buffer zone around the wetland. 		
Disturbance to wetland	Minimise disturbance in and around wetland	<ol style="list-style-type: none"> 1. Exclude stock around the wetland, particularly during bird breeding events. 		

Table 6: Sample management plan for activities

Issues	Aims/objectives	Actions	When and by whom?	Funding required? Source?



5 Step 4: Keeping track – how to measure progress

Keeping track of changes, or monitoring, is necessary in order to understand how your management activities are affecting your wetland, and whether you are achieving your objectives.

- Take a look at your original objectives, and decide on the best way to monitor the results of any activities you have undertaken.
- Plan how you will monitor your activities by setting out details of who will be carrying out the monitoring, how often the activities will be carried out and what resources will be required to do it (see Table 7 for examples of these). You can keep a record of these in Table 8 (next page).

Section 6 in the Resource Folder “Keeping Track (page 25) includes some monitoring methods for your wetland management activities, including using photography and observing plants and animals, with some help from information sources including plant and animal reference materials, etc.

Table 7: Example of a monitoring plan

Objective	Monitoring Methods	Resources required	How often?	By whom?
Manage weed infestation	Take photos of weed infested areas at regular intervals before, during and after activities such as weed removal have taken place.	Camera, film		
Manage livestock with regard to wetland birds and vegetation	Monitor using photography and noting bird species arriving at the wetland over time.	Camera, film; bird identification manuals, recording materials (paper, pens, etc.)		
Control feral and introduced animals	Monitoring by coordinating a register of sightings of these animals, such as pigs, among your neighbours. Photos may also be used to monitor recovery of vegetation previously destroyed by these animals.	A means of collecting information on sightings (phone, etc); camera, film.		

Table 8: Monitoring plan

Objective	Monitoring Methods	Resources required	How often?	By whom?

5.1 Management problems – when things don’t go to plan

Sometimes it seems like management is achieving nothing. There are some reasons why this may be the case. Some changes can take longer than others, the changes may be difficult to see or the problem may require a different management strategy.

5.2 Plan for maintenance

Decide who will be responsible for maintenance of the wetland, how often maintenance will be carried out and what resources will be required to do it. Maintain records of the management methods you have used, along with the information you collect. Making your plan a living document (one that changes through time) can help.

Table 9: Maintenance plan

Objective	Maintenance Methods	Resources required	How often?	By whom?



References

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Mound spring in an inland wetland

Photo courtesy of Dr. Surry Jacobs, Royal Botanic Gardens