



Chapter 5

Practical Approaches to Environmental Issues



This chapter outlines steps golf clubs can take to improve the management of the environment of which they are a part.

Water pollution

Obtain an understanding of legislation in relation to water pollution, through attendance of relevant training seminars, and further reading. An excellent reference which explains environmental law in layman's terms is the Environment Defenders Office Law Fact Sheets. Currently these have only been developed for NSW and Queensland legislation.

Backflow prevention devices should be installed on all taps connected to mains water. This will prevent any pollution of the mains water supply.

Avoid application of pesticides and fertilisers when high soil moisture conditions exist, to reduce pesticide and nutrient runoff.

Develop pest and nutrient management programs that utilize pesticide and fertiliser formulations with low runoff potential

Filling and handling of pesticides must not occur where spillages can directly enter the stormwater or sewerage systems. Install filtering systems and leak-holding sumps for pesticide and fuel storage and mixing areas.

Develop a plan of management for storm water entering and exiting the course. Initiate a water quality monitoring program for the course to determine sources of pollutants. The best sites to sample are entry and exit points of water on the course. The entry points will pick up the pollutants coming in from a myriad of sources such as streets, effluent water, shopping centre runoff, road drainage - the list will be specific for each course. The exit points will pick up any additional pollutants which are added to the water. Sites may include bores, pipes from and to stormwater, green drainage pipes, creeks, lakes and effluent inflow pipes.

Water should be analysed for nutrients, suspended solids, oxygen requirement, pesticides, pH, electrical conductivity and some heavy metals, depending on the surrounding land use and golf course inputs. For example if the course is irrigated by factory effluent, test for heavy metals. Pesticide testing should be done for specific pesticides which are used on the course. Sample at exit points, such as green drainage pipes, at the first large rainfall event after the pesticide is applied.

Participate in a Total Catchment Management or Landcare group. There are great benefits for the club through the network of new information and resources available by allowing others in the catchment to understand the issues involved in golf course management.

Investigate equipment wash-down facilities which treat and re-cycle water. These areas have the potential to be a significant source of pollution. The use of a "pre-wash" area on the course, where an initial wash of equipment is carried out before proceeding to the wash-down area can

dramatically limit pollutants which need to be filtered from the final wash-down water. The 'pre-wash' area should be well grassed and the initial wash can be a simple hosing to remove all the grass clippings and larger particles.

Maintain or plant well vegetated buffer areas in the riparian zones on the banks of all wetlands and waterbodies. These areas should not receive pesticide or fertilizer application. If buffers are grassed, maintain maximum height to increase the filtration effect. A well vegetated riparian zone will also help control erosion of the banks.

Irrigation

Comply with legislation covering particular sources of irrigation water. Effluent water has public health and safety issues associated with its use, while in some regions the groundwater is regulated. Clubs should understand and adhere to any legislation governing their water supply.

- Investigate alternative water sources, and their availability and quality for turf irrigation.
- Regularly monitor irrigation water where sources are marginal or fluctuate in quality.
- Select turf grasses and other plant species with consideration of their suitability for the local climate. Species which are grown outside their optimum climate will require greater inputs for their management.
- Install soil moisture monitoring equipment, to improve irrigation efficiency.
- Irrigation system design can significantly influence the efficiency of irrigation application. Newer systems allow greater control and flexibility over irrigation applications.

Comply with restrictions associated with the use of effluent irrigation water. Health issues must be addressed. Local authorities may impose restrictions on the hours of operation of irrigation and with-holding periods before players and/or staff are allowed onto irrigated areas. If such restrictions do not apply, golf clubs should consider these issues for the safety of their staff and players.

Before Irrigating consider

- Current level of stored water in the soil
- Water storage capacity of soil type
- Impending climatic conditions, especially temperature and the possibility of rain.

Fertiliser application

Monitor plant nutrient status through regular soil and/or leaf tissue analysis. Annual comprehensive soil nutrient analysis with bi-annual soil testing for pH and electrical conductivity are a minimum for all fertilised areas.

Match timing and quantity of fertiliser applications to soil type and expected uptake rate by the grass. Greens



Nature walk, Swansea Golf Club Tasmania

Swansea Golf Club, Tasmania

Swansea is a small coastal town, 140km north east of Hobart, Tasmania. The nine hole golf course is situated on Waterloo Point headland, a popular site for walking, sightseeing and rock fishing.

The headland is a nesting site for Short Tailed Shearwaters and Little Penguins, and is recognised as a highly significant Aboriginal site. In 1996 the headland was primarily under the management of the club, and a maze of walking tracks covered the headland, endangering walkers from golf balls and wildlife and historical sites from trampling.

The club was invited to become part of a project to rehabilitate the area, in conjunction with the local council, the Chamber of Commerce, the East Coast-Care group and the Parks and Wildlife Service. The aims of the project were to prepare a management plan for the area to:

- *protect the natural and heritage values of the area, and reduce erosion*
- *provide a safe tourist attraction*
- *ensure walkers do not stray onto fairways and are considerate of teeing-off golfers*
- *provide employment and skills for the local community.*

Local community volunteers pitched in with the building and revegetation of the track, and the track was opened on the 26th of September 1996 by the Minister and one of the oldest local identities. The club supported the project and said that the track had benefits for the club, tourists and the local community.

constructed on sand profiles have a relatively low potential for retention of nutrients. In these areas apply small quantities of fertiliser more often, and make use of controlled and slow release fertilisers.

Choose fertilisers with a low heavy metal content to reduce the risk of pollution and future contaminated soil problems. Many states have introduced legislation to include the heavy metal content on fertiliser labels. If such information is not available on the label obtain it from the supplier.

Investigate and trial plant conditioning products such as sea weed extracts and organic fertilisers. These offer slow

nutrient release, a range of trace elements and encourage an active and diverse soil biology.

Maintain up to date fertiliser application and associated records.

Apply appropriate irrigation to ensure that fertilisers do not run-off or leach.

Investigate and trial products which claim to improve fertiliser efficiency, such as nitrification inhibitors. While research data on these is limited they may be useful in an overall fertiliser program.

Dispose of used fertiliser bags in a way to minimise the risk of possible water pollution.

Soils

Fertiliser and pesticide applications should not be made to exposed soil surfaces, particularly sandy soils, but restricted to turf areas. Turfgrass and the thatch layer are excellent filters of nutrients and pesticides.

Amelioration and soil conservation practices need to be carried out on degraded soil. Degraded soils include those which are acid, saline and/or suffering from erosion.

Golf clubs in coastal areas may have acid sulphate soils. Acid sulphate soil risk maps are available from the state land management agency (see Appendix 1). If these indicate a high probability of acid sulphate soils, further investigation should be conducted through a detailed soil survey. Golf clubs with acid sulphate soils need to follow published guidelines when conducting activities which may affect these soils.

Pesticide application and storage

Curative not preventative pesticide application should be practised whenever possible. Always consider pesticide alternatives before using a pesticide.

Correct storage facilities for pesticides must be provided. The Australian standard, AS2507 - The storage and handling of pesticides, should be used as an initial reference (see Appendix 6).

Pesticide group rotation must be practised to reduce the possibility of pest resistance or the development of pesticide enhanced biodegradation. Details on herbicide, fungicide and insecticide chemical groups are available from Avcare.

Monitor pest numbers and damage regularly. Develop damage threshold levels which can be tolerated by golfers and where control will be possible, to determine when a pesticide application is required.

To reduce the risk of drift and water pollution do not apply pesticides in strong winds, or if rainfall is likely.

Player safety from pesticides must be maximised. This may involve withholding periods before players are allowed onto pesticide treated areas.

Choice of pesticide formulations should involve consideration of the environmental impacts. More soluble pesticides have a greater potential to leach than granulated forms, however granulated forms may run-off in storm events.

Pesticide operators should be familiar with the toxicity and hazard rating of pesticides. Material Safety Data Sheets (MSDS) must be available in the maintenance shed for all chemicals. A copy of these should also be held by the club in case the originals are lost or destroyed.

A hazardous chemicals inventory list, including pesticides, fuels and oils should be kept in the maintenance shed. A copy should be held by the club in case the originals are lost or destroyed.

Additives to pesticide tank mixtures such as wetting agents, stickers, and oils, can improve pesticide efficacy and reduce environmental impact. They can provide a range of benefits including rain fastness and improved penetration into the pest.

Appropriate legislation must be understood and adhered to for pesticide storage, transport and application. The pesticide label is a legal document, and the information related to the application of the product must be followed.

The issue of providing notification on pesticide use to players and the surrounding community is a difficult one. Some clubs alert members of pesticide applications through the use of notices and signage boards. Some clubs go one step further and inform the surrounding houses of pesticide applications through letter drops or notices in local newspapers.

No general direction can be given to golf clubs on this matter but on balance some form of notification is reasonable and these issues should be considered by all clubs.

Plant growth regulators reduce mowing time and production of grass clippings, and improve the turfgrass surface quality. These products can be supplemented into fertiliser and pesticide management programs.

Pesticide Application

- Use minimum impact equipment such as boom sprays with hoods or skirts to minimise drift.
- Calibrate and maintain equipment correctly.
- Applications should be made by appropriately trained staff.

Apply appropriate irrigation to place and maintain pesticide at target site. For targets in the thatch, minimal irrigation will move the pesticide to the target site and remove it from the surface. This will reduce the potential for staff, players or wildlife coming into contact with the pesticide. Excess irrigation may move the pesticide in run-off or leaching waters.

Keep appropriate pesticide application and storage records. A copy of these should also be held by the club in case the originals are lost or destroyed.

Monitor effects of pesticides on off-target species, such as birds. Ground staff, players and the surrounding community can help to identify adverse impacts of pesticides. Regular inspections of wildlife habitats may indicate if toxic effects on wildlife are occurring. Routine blood testing of staff will detect any health problems with pesticide use. Surveys of players and the surrounding community may help determine if any health problems have been experienced.

Correct pesticide container disposal must occur. Avcare guidelines for triple rinsing and disposal of containers should be followed.

Bioremediation of excess pesticides, pesticide solutions and rinsate from containers and application equipment is being implemented in agricultural industries. While this form of technology may be applicable at some clubs, if all pesticide solutions and rinsate are applied to turf areas a disposal problem should not occur.

Peninsula Country Golf Club, Victoria

Located 39 km south-east of Melbourne is the Peninsula Country Golf Club. The golf course is situated in a natural sand belt with extensive areas of remnant vegetation.

*Major revegetation programs undertaken at the club have attempted to re-introduce native heath species to areas which have become dominated by *Leptospermum* and *Acacia* species. The major tool used in these revegetation activities is the utilisation of the existing seed bank of heath species in the soil. Regeneration from this seed bank has been achieved by manual removal of undesirable species and the use of fire.*

In addition, topsoil is collected from adjoining housing developments and spread out on the golf course to further make use of the natural soil seed bank. The cost of establishing new plants has been minimised, the unique genetic diversity of local plants has been preserved and an unwanted resource has been utilised.

In certain locations on the golf course the local heath has been encouraged to become an increased aspect of play by utilising plants around bunkers and incorporation into mounds between tee and fairway. In the future fairways may become islands of turf surrounded by native vegetation. It is hoped that the native vegetation will provide a habitat for wildlife and predatory insects and spiders which in turn will aid the natural control of turfgrass pests.

J. Kaapro/ATRI



Dead trees can represent an important habitat for wildlife, but the safety of staff and golfers must also be considered.



Revegetation of native species has been a major achievement at Peninsula Country Golf Club, Victoria.

J. Kaapro/AT

Pesticide residues may accumulate in de-thatching refuse which is removed during renovation. The disposal of this material may pose a pollution hazard. A management plan for disposal of such material should be developed. This may include some laboratory testing to determine the levels of pollutants.

Methyl bromide is used for fumigation of areas prior to turf establishment. This chemical is an ozone depleting gas and its use should be minimised while it is still available for use. Methyl bromide use for soil fumigation is being phased out in Australia by 2005.

Construction

Upslope stormwater must be diverted around construction sites, with care not to cause flooding or erosion from the diverted water.

Vehicle access should be restricted as this increases noise and air pollution, results in soil compaction (especially when the site is wet) and exposure of bare soils.

Disturbance to vegetated areas should be minimised to reduce the risk of erosion. Mulch or revegetate disturbed areas as soon as possible after construction is complete.

Stockpiles of materials should be located and protected so that there is minimum risk of water and air pollution. Sediment control measures such as basins, traps and filters must be used where necessary to minimise water pollution.

The soil may involve material which is contaminated with pesticide residues, heavy metals or other substances. Contaminated materials must be disposed of according to legislation. Most state governments have published strategies for dealing with contaminated materials.

Loading and unloading of soil and sand materials should be conducted in wind protected areas or when calm conditions exist. Before commencing construction activities determine local regulations on noise levels and allowed hours of operation. Consider the potential to cause noise pollution when selecting equipment to be used for construction activities.

Waste

- Vegetative refuse (turfgrass clippings, scarifyings, tree and shrub trimmings) should be chipped and/or composted for mulch.
- Recycle batteries and metals with scrap metal dealers.
- Used oils can be recycled through local councils, contractors or service stations.
- Some plastics can be recycled. See the local council for further details.

Wildlife

Wildlife habitats provide water, food and shelter for native animals. These factors must be considered when attempting to develop wildlife habitats on golf courses. The use of local native vegetation is an integral component of wildlife habitats.

Retain old dead trees with hollows as they provide a habitat for a range of wildlife.

When constructing new wetlands or waterbodies consider having deep water and shallow water areas to provide a diversity of aquatic habitats. Consider the possibility of having an island to provide a safe haven from foxes and cats. Provide nesting sites by using hollow logs.

Examine if existing waterbodies and wetlands can be modified in line with the suggestions above.

Expertise and information on the management of wildlife can be obtained from state wildlife agencies (Appendix 1), environmental information centres (Appendix 2) and from environmental groups (Appendix 4). In a specialised area such as this it is advisable to use the expertise and knowledge of these groups. Such groups may also be able to assist in appropriate training.

Currently no environmental accreditation/ certification systems for golf courses in Australia exist. Some states have schemes operated by the government or by environmental groups in which golf courses may be able to participate.

Wildlife management is governed by various pieces of legislation. Recently new and modified legislation has been introduced in many states with respect to endangered species. Golf course managers need to be aware of legislation as it pertains to wildlife and how it will impact golf course management activities

Vegetation corridors aid in wildlife migration. These need to be considered within the golf course and joined with other similar vegetated areas in the local area.

Pesticide impacts on wildlife have dramatically decreased with the phasing out of various chemical groups, such as most Organochlorines. The development of less toxic, more selective chemicals which are used at far lower rates has also helped. Nevertheless consideration must still be given to pesticide use and wildlife especially in fragile habitats such as aquatic ecosystems.

Noxious animals can create problems on golf courses. They may even be harboured on a golf course from which they venture into the surrounding area. For guidelines on the management of noxious animals it is advisable to contact both the local council and the state government agency responsible for agriculture. The state government agency will be able to provide advice on management practices while the local council may have specific regulations on certain activities (shooting, baiting etc.).

All golf courses are encouraged to conduct wildlife surveys, to determine the wildlife species which frequent the course. This information can influence the management of the course to preserve habitats.

Wildlife populations can cause damage to golf courses. Various bird and mammal species are a major problem in the destruction of putting greens. For management information it is advisable to contact the local state agency for wildlife and the local council.

Carnarvon Golf Club, NSW

Carnarvon Golf Club is situated in suburban Berala, 14 km west of Sydney. The club utilises stormwater from street runoff for irrigation, and excess stormwater flows through the course and exits to form the headwaters of Haslam's Creek. This creek has come under increasing scrutiny from the public and environmentalists because it empties into Homebush Bay, the site of the Sydney 2000 Olympic Games.

In the early part of 1996, the club formed a partnership with the local Christian Community High School, Regents Park, for students to monitor water quality on the course through the NSW Streamwatch Program. This program came about through contact by Peter Barnes, the science teacher, with the Environmental Services Officer at the local council. One third of the costs of the sampling equipment and testing chemicals is sponsored by the club.

Streamwatch is a school and community education program. Through sampling for water quality, habitat assessment, algal testing and macroinvertebrate sampling, it helps participants develop 'ownership' of their waterways, and the skills to take action. The program was initiated through Sydney Water in 1990, and a national

Waterwatch program, with the same goals and strategies as Streamwatch, also exists.

Craig Easton, the superintendent at the club has been keen to support the program. It has had benefits for the club through a database of information on their water quality collected by regular monitoring. It allows the club to monitor the effects of irrigation, fertiliser and pesticide applications on water quality. The students collect real and useful data on the chemical, physical and biological processes in waterways in their local area. Through this they gain scientific skills, environmental awareness and become a part of the decision making process to act on the results collected.

Results to date from the program have shown fluctuations in dissolved oxygen, turbidity, pH and other water quality characteristics. As the general source of the water on the course is runoff from streets and industrial areas there has been a wide and varied composition of plastic bags, oil and other rubbish in the dams.

To contact Streamwatch in NSW, or Waterwatch in other states, to start a stream-watching program of your own, see Appendix 2 (NSW Dept. of Land and Water Conservation).



Students participating in Streamwatch collecting samples from Carnarvon Golf Club, NSW



Table 8.
Environmental Monitoring Programs

Monitoring Program	Category	Method	Parameters
Water	Environmental	Laboratory	Nutrients, suspended solids, oxygen requirement, heavy metals, pH, EC
	Irrigation	Laboratory	pH, EC, cations, anions, pathogens ¹
	Drinking	Laboratory	as per Australian Standard for Drinking Water
	Spray mixtures	Laboratory	pH, EC, hardness
Soil	Nutrient	Laboratory	pH, EC, nutrients, organic matter
	Contamination	Laboratory	Heavy metals, pesticides, hydrocarbons
	Nematodes	Laboratory	Plant parasitic nematodes
Climatic	Weather	Weather Station	Rainfall, relative humidity, minimum and maximum temperature
Conservation	Wildlife	Survey	Species diversity and abundance
	Vegetation	Survey	Species diversity and abundance
Health and safety	Staff	Blood Testing ²	Full blood count (FBC), Clinical biochemistry analysis (MBA),
	Players	Survey	Design to individual needs
	Local community	Survey	Design to individual needs

1 for effluent water sources

2 a medical authority should be consulted before commencing this program

Native vegetation

Identify out of play areas on the course and use these areas to encourage and establish native vegetation. Initial weed removal and encouragement of native species may take some time, however once mature, these areas should require minimal maintenance, and save on irrigation, fertiliser and maintenance costs.

Retain all possible remnant native vegetation, and link these areas if possible.

Establish plants which are local native species.

Carry out a survey of flora species present and those that used to be present before clearing.

Obtain expert advice on the establishment and management of native vegetation, such as how to use fire to break dormancy of native seeds. Information centres (Appendix 2), environmental groups (Appendix 4) and local nurseries are all good sources of information and advice.

Forming links with appropriate environmental groups or local councils can also aid with possible staff training in the management of native plants.

Native vegetation selection, establishment and management will form a wildlife habitat which is suitable for native species.

The bushfires around Sydney in the early 1990s demonstrated the value of golf courses, as buffers between

highly combustible bushland and urban development. Bushfire management can affect golf courses as they are significant areas of land with vegetation. Local bushfire groups and state bushfire control centres should be consulted for further information on hazard reduction, and other planning in relation to bushfire management.

Legislation and local regulations for vegetation removal need to be consulted before these activities are carried out.

Golf clubs are required to control noxious plants. The state agriculture agency and local councils can provide assistance with identification and control methods.

Impact of vegetation management on golf play strategy and speed, must be considered before carrying out mass plantings of native plants. Trees which are planted small will grow, and may change the original playing strategy of a particular hole. Areas of unmown native grasses may slow play due to time spent searching for golf balls. Education of golfers on the benefits of native plants is recommended.

Wetlands and Waterbodies

Where possible maintain native aquatic and bank vegetation as this will provide habitat for wildlife. The vegetation may be in the riparian zone, in the water, on the water or on islands.

Provide logs, dead trees and islands as they will provide a

Provide shallow and deep water areas to provide a diversity of habitats, especially for birds.

Manage all pest species including plants and animals which may deteriorate the quality of the wetland.

Waterbodies and wetlands can play an important role in reducing nutrient and pollutant loads in run-off water, which enters the golf course from the surrounding catchment. If the wetland or waterbody is located at a low point of the course, purification of run-off water will also be achieved.

It may be possible to introduce some native wildlife, especially fish, to waterbodies. The local state agriculture agency can generally help with further information.

The management of water bodies to maintain water quality should primarily be focussed on making sure the quality of incoming water is maximised. The installation of aerators in some cases can enhance water quality. The addition of chemicals or other substances to improve water quality is generally the last option which should be used.

Groundwater

Groundwater levels need to be monitored for changes which may occur. Where golf courses draw water from bores or groundwater-fed dams for irrigation, it is recommended to monitor groundwater levels to determine the sustainability of reserves. Irrigation from other water sources may lead to raising of the groundwater with the potential to then cause salinisation.

Groundwater quality also needs to be monitored by golf courses. If the water is being used for irrigation this will help determine the suitability of the water. Monitoring groundwater quality can also determine if pollution from leaching of nutrients and/or pesticides is occurring.

Heritage

Legislation as it applies to heritage sites must be understood and adhered to. Contact the state agency for heritage to obtain further information.

Historical, heritage and special interest groups can help with advice on management of heritage sites.

Member education of heritage sites is most important. The value of sites and their required protection needs to be understood by members.

Environmental Monitoring

The establishment of environmental monitoring programs is an important component of golf course management.

The development of monitoring programs requires expert advice to decide what to monitor, where to monitor, when to monitor and how to monitor. Table 8 suggests monitoring programs which golf courses can implement.

Environmental Planning

Establish an internal club committee to deal with environmental matters. Include management, greens staff and members.

Golf clubs should develop an environmental management plan. This plan must identify the areas where the golf course makes an environmental impact and then establish a plan which seeks to minimise pollution, conserves resources and enhances the golf course environment.

Benefits of environmental monitoring for golf course managers

- factual information to test environmental performance
- demonstrate compliance with environmental legislation
- safeguard the interests of the golf club
- safeguard the surrounding environment and community
- prevent environmental litigation

Role of the Golf Course Superintendent and the Environment

Australian golf course superintendents form part of the senior management team at golf clubs within Australia, and are responsible for the preparation of long term land management plans, which define future directions for the ongoing maintenance and development of the golf course, and associated landscape. They have the responsibility to maintain the golf course under strict budget and environmental control, and have developed an ethos for integrated pest management. Golf course superintendents ensure that everything from the day to day management of the golf course through to financial planning have regard for environmental considerations. Harnessing the wealth of knowledge available in both the private and public sector, Australian golf course superintendents are the hub for environmental information, for club members and committees. They play the key role in disseminating course management information and relevant environmental legislation, which keeps members and the public informed of the responsible management techniques employed by golf clubs. As workplace educators they are involved in both the formal and informal training of their staff and members.