

**Inland
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Interlaken Lakeside Reserve

Ramsar Wetland Management Plan

*Rehabilitation
of Lakes Sorell
and Crescent
Report Series*

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Interlaken Lakeside Reserve Ramsar Wetland Management Plan

**Integrated and multi-disciplinary approach to the
rehabilitation of Lakes Sorell and Crescent**

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Inland Fisheries Service

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This report is part of a series of documents, which provide management recommendations for the environmental requirements of lakes Sorell and Crescent as part of the Lakes Sorell and Crescent Rehabilitation Project.

The aim of the rehabilitation project is to obtain an understanding of the systems, identify the needs of the users of the lakes and subsequently provide recommendations for the future management and protection of these important ecosystems.

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Executive Summary

A decline in the trout fishery, water quality and ecological values of lakes Sorell and Crescent has occurred over the past few years. In light of these problems, the Inland Fisheries Service (IFS) secured State and Commonwealth (Natural Heritage Trust) funding to implement on-ground works and formulate management options to address the recent environmental decline. The key problem associated with the lakes is low water levels due primarily to drought conditions and competition for water by various users. A multi-disciplinary approach was adopted to address the situation – the Lakes Sorell and Crescent Rehabilitation Project. This project was comprised of ten sub-projects which targeted key areas of physical and biological importance to the functioning and management of lakes Sorell and Crescent. The ten sub-projects were:

- Lake Crescent Outflow Screen Duplication
- Mountain Creek Rehabilitation
- Water Management Plan
- Catchment Management Plan
- Water Quality
- Wetlands
- Aquatic Fauna
- Recreational Fisheries
- Carp Management
- Ecological Modelling

The recent dry period experienced in the lakes Sorell and Crescent area has resulted in the wetlands associated with the lakes remaining relatively dry for the past 5-6 years. Concern was raised regarding the impact these dry years have had on the wetland vegetation, particularly significant plant species that occur in the internationally significant Ramsar wetland, the Interlaken Lakeside Reserve. The wetlands are important in the conservation of the Sorell-Crescent ecosystems, due to their use as habitat, refuge and a food source for many plants and animals. The significance of the wetlands has justified the inclusion of the wetlands study within the overall project – the Lakes Sorell and Crescent Rehabilitation Project.

The objectives of the wetlands sub-project of the Lakes Sorell and Crescent Rehabilitation Project were to:

1. Determine the effect of lake levels on the health of the wetlands.
2. Recommend lake level regimes for sustaining the wetlands.
3. Assess and report on the status of Reserves.
4. Compare the composition and extent of aquatic vegetation present within the wetlands with findings of previous studies.
5. Identify threatening processes to wetlands in both lakes.
6. Produce a plan detailing recommendations for conserving and restoring wetlands and weedbeds in Lakes Sorell and Crescent.

The aims of these objectives were to provide the IFS with information to develop an optimum water regime for the wetlands. The intended outcomes were to enhance and protect these areas and ensure that they retain their health and ecological value.

Three reports make up the findings and management recommendations for the sub-project - Wetlands:

1. Wetlands of Lakes Sorell and Crescent: Conservation and Management
2. Interlaken Lakeside Reserve. Ramsar Wetland Management Plan
3. Hazelwoods Lagoon. Aquatic Vegetation Survey

This document outlines the management recommendations for the conservation of the Ramsar wetland – the Interlaken Lakeside Reserve.

The Interlaken Lakeside Reserve in the north-west corner of Lake Crescent on Tasmania's Central Plateau, is internationally recognised as a significant wetland by its listing under the Convention on Wetlands (Ramsar, Iran, 1971) (Ramsar Convention). Tasmania currently has 10 Ramsar wetlands including the Interlaken Lakeside Reserve. The entire reserve is approximately 520 ha in area consisting of one-third (180 ha) open water, one-third (166 ha) dry land, and one-third (174 ha) which is a shallow, freshwater wetland which is the basis of this management plan.

The wetland supports a diverse assemblage of aquatic macrophytes, including the poorly reserved swamp wallaby-grass (*Amphibromus neesii*) (currently listed as rare under the Tasmanian *Threatened Species Protection Act 1995*) and mountain isolepis (*Isolepis montivaga*), both of which are found in only a few locations throughout Tasmania.

Inundation of the wetland section within the Interlaken Lakeside Reserve stimulates rapid growth of aquatic vegetation bringing the wetland to life. It maintains great biodiversity for the region and provides important habitat for macroinvertebrates, frogs, fish and waterbirds. When full of water, the wetland protects the hydrobiid snail (*Austropyrgus* sp.) which is endemic to the lakes Crescent and Sorell area and provides a valuable habitat for the small, native fish, golden galaxias (*Galaxias auratus*) which is only found in lakes Crescent and Sorell and their associated streams and wetlands. The golden galaxias is currently listed as rare under the Tasmanian *Threatened Species Protection Act 1995*.

The Interlaken Lakeside Reserve and nearby lakes and wetlands have previously supported high numbers of waterbirds including swans and ducks. Five migratory bird species, the great egret (*Ardea alba*), cattle egret (*Ardea ibis*), Latham's snipe (*Gallinago hardwickii*), white-bellied sea eagle (*Haliaeetus leucogaster*) and the caspian tern (*Sterna caspia*), which are all protected under both the Japan-Australia Migratory Bird and China-Australia Migratory Bird Agreements (JAMBA/CAMBA), also use the wetland for feeding and resting.

In light of these important values and to provide further protection, an application has been submitted to the Nature Conservation Branch, Department of Primary Industries, Water and Environment (NCB, DPIWE), requesting that the Interlaken Lakeside Reserve be considered for reserve status under the *National Parks and Wildlife Act 1970*, namely as a "Conservation Area".

Threats impacting on the values of the Interlaken Lakeside Reserve include altered water regimes, introduced fauna, particularly European carp (*Cyprinus carpio*), weeds, recreational activities and potential pollution from adjacent housing developments.

Interlaken Lakeside Reserve should be managed to protect its outstanding conservation values, whilst maintaining a wise-use approach in providing limited recreational activities.

Accordingly, the key management recommendations for the Interlaken Lakeside Reserve aim to:

- maintain and protect biodiversity;
- protect threatened flora and fauna species and communities;
- improve water quality within Lake Crescent;
- protect any aboriginal sites within the reserve;
- recommend reserving the area as a Conservation Area under the *National Parks and Wildlife Act 1970*;
- maintain or seek to restore an appropriate water regime for the wetland;
- ensure livestock grazing remains prohibited on the wetland;
- recognise measures to control and eradicate European carp (*Cyprinus carpio*);
- protect the wetland from exotic weeds;
- protect the wetland from potential water pollution from nearby housing areas;
- provide for recreational fishing within the reserve in accordance with IFS regulations;
- recommend removing duck shooting from the reserve;
- provide facilities within the reserve to encourage minimal impact camping and
- promote the importance of the Ramsar site and educate users of threatening impacts to the wetland.

Acknowledgments

Many people and organisations have contributed to the development, implementation and outcomes of this project to which I owe much appreciation.

John Diggle (Inland Fisheries Service) managed the Lakes Sorell and Crescent Rehabilitation Project and provided valuable advice and support. The Lakes Sorell and Crescent Rehabilitation Project team consisting of John, Jenny Deakin (Water/Catchment Management), Scott Hardie (Aquatic Fauna), Adam Uytendaal (Water Quality), Brett Mawbey (Technical), Helen Mulcahy (Technical) and Keith Breheny (Technical) provided a dynamic working environment offering motivation and inspiration when needed.

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On-ground works consisting of erecting a boundary fence at the Interlaken Lakeside Reserve could not have been completed without the assistance and support of Crown Land Services (CLS)-Department of Primary Industries, Water and Environment (DPIWE), Conservation Volunteer Australia volunteers (through the Revive Our Wetlands program), Clarence and Bridgewater anglers, Parks and Wildlife Service (PWS), Lake Crescent shackowners and IFS staff. Support for the fencing off of the wetland also came from John Toohey (CLS-DPIWE).

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David Geoghegan and Mike Cousins (PWS) provided support with regard to management of reserves. The Tasmanian Parks and Wildlife – Planning Section provided input into some of the recommendations, particularly relating to the relevant issues of reserve management.

Abbreviations

AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environmental Conservation Council
CAMBA	China-Australia Migratory Bird Agreement
CLS	Crown Land Services, DPIWE
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DPIWE	Department of Primary Industries, Water and Environment
EAASSN	East-Asian-Australasian Shorebird Site Network
EPBC	Environment Protection and Biodiversity Conservation
FRDC	Fisheries Research and Development Corporation
IFS	Inland Fisheries Service
JAMBA	Japan-Australia Migratory Bird Agreement
NES	National Environmental Significance
NCB	Nature Conservation Branch, DPIWE
PEVs	Protected Environmental Values
PWS	Tasmanian Parks and Wildlife Service, Department of Tourism, Parks, Heritage and the Arts
WQOs	Water Quality Objectives

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1. Introduction

This management plan covers all of the land in the north-western corner of Lake Crescent known as the Interlaken Lakeside Reserve. The area was first reserved as a public reserve in 1981 and was listed as a Wetland of International Importance under the Ramsar Convention (Ramsar, Iran, 1971) in 1982.

The entire reserve is approximately 520 ha in area consisting of one-third (180 ha) open water, one-third (166 ha) dry land, and one-third (174 ha) which is a shallow, freshwater wetland. Most of the recommendations outlined in this report focus on the conservation and protection of the wetland area. For the purpose of this plan, the terms Interlaken Lakeside Reserve, reserve and wetland have been used interchangeably and usually refer to the wetland section of the entire reserve.

The Interlaken Lakeside Reserve is important for nature conservation because of its unique and diverse flora and fauna, some of which are listed as threatened species under the Tasmanian *Threatened Species Protection Act 1995*. The wetland is a good example of a shallow, freshwater wetland supporting diverse assemblages of typical wetland vegetation including sedges, rushes, submergent and emergent species. The reserve is an important resting and feeding site for many waterbirds, including significant migratory birds. The wetland periodically dries out and when inundated, the wetland provides important habitat for macroinvertebrates, frogs and fish.

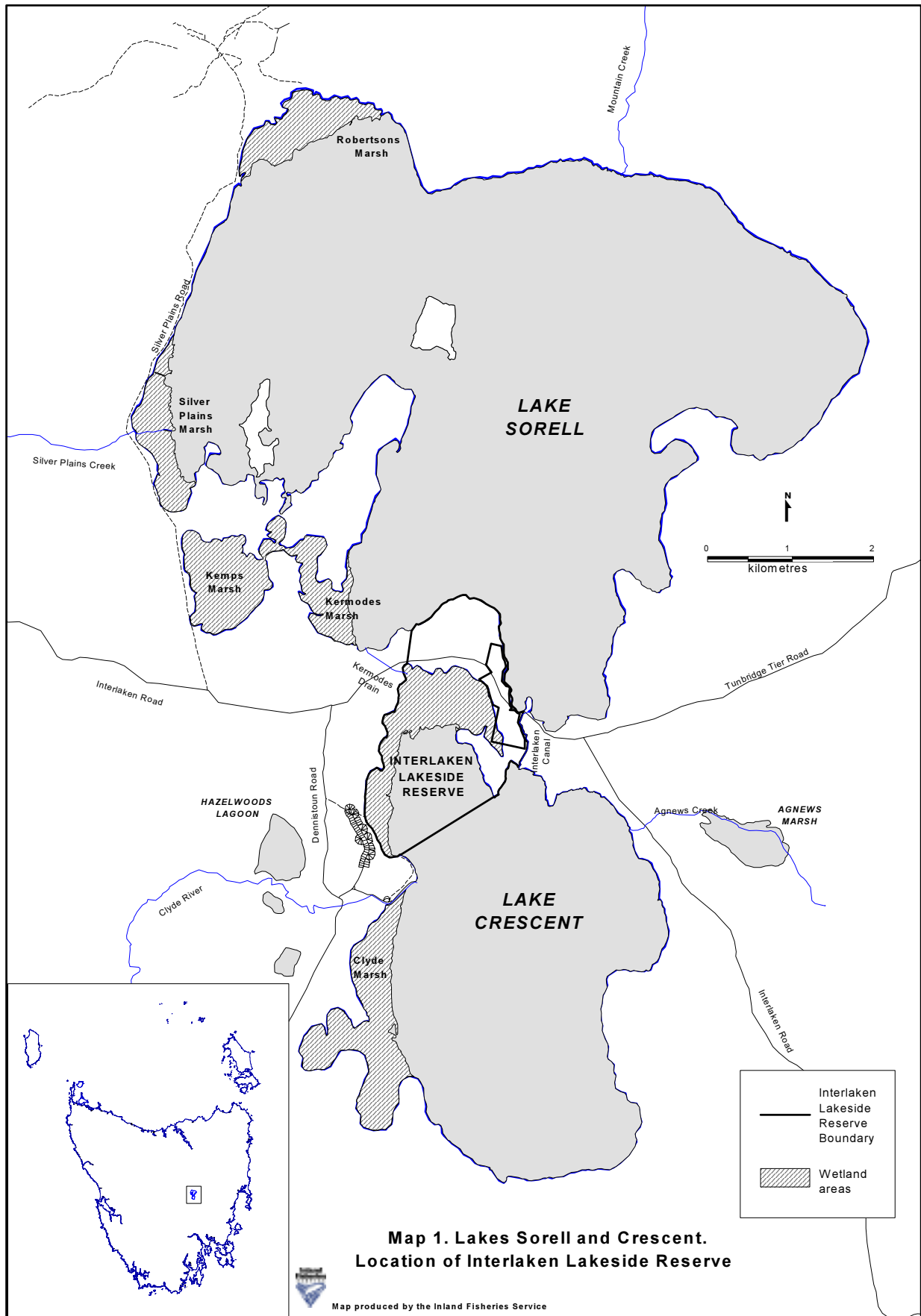
This plan outlines the long-term management objectives for the Interlaken Lakeside Reserve. It aims to describe the conservation and recreational values, threatening processes and provide management recommendations to ensure the wetland's unique values are preserved and enhanced.

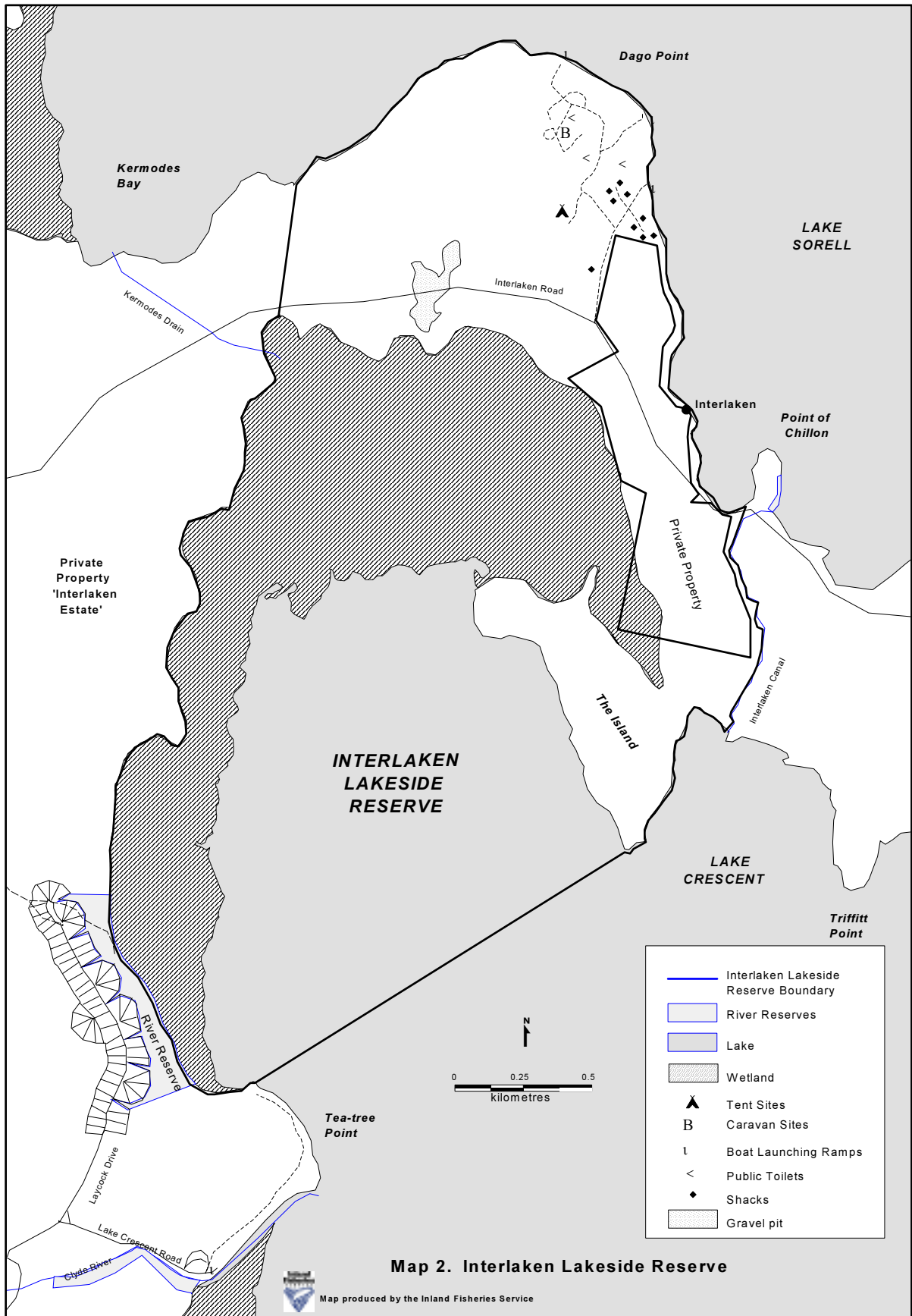
1.1. Location and access

The Interlaken Lakeside Reserve (Maps 1 & 2) lies between the interconnecting lakes Crescent and Sorell (co-ordinates 147°09'E 42°09'S), situated approximately 800 m above sea-level, on the south-east corner of Tasmania's Central Plateau. The entire reserve is approximately 520 ha in size consisting of a wetland and dry sclerophyll forest.

The area is divided by the Interlaken Road and is bound by Lake Sorell in the north, the Interlaken canal in the east and Lake Crescent in the south. The reserve is bordered by private property (Interlaken Estate) to the west. A 43 ha area of private property is located within the reserve boundary in the east (refer to Map 2).

One third (174 ha) of the entire reserve is a shallow, freshwater wetland in the north-west corner of Lake Crescent. At high water levels (above 802.8 m AHD) the wetland becomes inundated by Lake Crescent. The wetland area covers 7.5 % of the total surface area of Lake Crescent at full supply level.





The reserve is within the Central Highlands Council area. Access to the Interlaken Lakeside Reserve is via two roads off the Midlands Highway – the Tunbridge Tier Road (C526) and the Interlaken Road (C527). The Tunbridge Tier Road takes a route west for 25 km from Tunbridge. The Interlaken Road heads west from the township of Oatlands and joins the Tunbridge Tier Road after 26 km. The wetland is a further 2 km west along Interlaken Road. Both roads are unsealed except for short sections just off the Tasman Highway, but are suitable for 2-wheel drive vehicles. Another route that is often used is via the Lake Road (A5) to Bothwell. From Bothwell, the Dennistoun Road heads north-east where it meets the Interlaken Road and the reserve is a further 2 km east.

1.2. Land tenure, management agencies and reserve status

Interlaken Lakeside Reserve was reserved under the *Crown Lands Act 1976* in 1981. The site's land tenure is currently Public Reserve - Interlaken Lakeside Reserve (refer to Map 2). An application was submitted in June 2001 to the NCB, DPIWE, requesting that the Interlaken Lakeside Reserve be considered for reserve status under the *National Parks and Wildlife Act 1970*, namely as a Conservation Area. Under the terms of the *National Parks and Wildlife Act 1970*, the name "Conservation Area" is applied to an area of land predominantly in a natural state but mining, and in some cases, hunting may be permitted (PWS 2002a). The NCB has indicated that the outcomes of the application will be known by mid-2003.

The Lakeside Reserve is located within the Central North District of the PWS and is managed from the Liawenee base. The Interlaken Lakeside Reserve lies within the boundaries of the Central Highlands Council. The Inland Fisheries Service (IFS) currently manages Lake Crescent under the *Inland Fisheries Act 1995* due to the presence of the pest fish, European carp (*Cyprinus carpio*). Management of the water in Lake Crescent is currently operated by IFS in consultation with the Department of Primary Industries, Water and Environment (DPIWE) and the Clyde Water Trust.

1.3. Ramsar site

The Interlaken Lakeside Reserve was nominated as a significant wetland under the Ramsar Convention in 1982. A full description of the listing is presented in Appendix 1.

1.3.1. Wetland type

In accordance with the Ramsar Convention, the Interlaken Lakeside Reserve is classified under two categories – a) permanent freshwater lakes (>8 ha) which includes large oxbow lakes and b) seasonal/intermittent saline/brackish/alkaline lakes and flats.

Criteria met for Ramsar listing

The Interlaken Lakeside Reserve meets the following Ramsar criteria for listing as an internationally important wetland (full criteria listed in Appendix 2):

2. A wetland should be considered internationally important if it supports vulnerable, endangered or critically endangered species or threatened ecological communities.
3. A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

1.4. Climate

The Interlaken Lakeside Reserve is situated in a sub-alpine area which experiences frost and occasional to frequent snowfalls during winter. The warmer months of January and February experience a mean maximum temperature of 19.4 °C and a minimum of 6.4 °C. July is usually the coldest month of the year with mean maximum and minimum temperatures of 7.5 °C and -1 °C, respectively (BOM 2002). The mean annual rainfall for the region is 699 mm with the highest rainfall occurring during winter and spring (Deakin unpublished data).

1.5. Geology

The geology of the area consists of Jurassic dolerite, Tertiary basalt and Triassic sandstone with alluvial deposits common on flats and swampy ground (TDOM 1986).

1.6. Catchment

The catchment of the wetland section of the Interlaken Lakeside Reserve is relatively small with respect to the size of the wetland and is approximately 400 ha in size. Drains in the north west corner and the south add additional area to the catchment. Most of the catchment is privately owned and has been cleared for grazing.

1.7. Hydrology

Water levels within Lake Crescent generally dictate whether the Interlaken Lakeside Reserve is wet or dry. The wetland fills up when water levels rise within the main lake and flood back into the wetland. Inundation cannot fully occur unless the lake level of Lake Crescent is high (>802.8m AHD) and water is backfilled into the wetland area. At this point the wetland is inundated by the main lake. However, when water levels within Lake Crescent are lower, the Interlaken Lakeside Reserve receives water via run-off from its surrounding catchment during high rainfall events, which ponds in the wetland, until it either drains into Lake Crescent or evaporates. Water can also flow from the adjacent Lake Sorell into the Interlaken Lakeside Reserve via Kermodes Drain (refer to Map 2) when lake levels in Lake Sorell are above 804.36m AHD.

The Interlaken Lakeside Reserve is relatively flat with the largest gradient occurring along the outer edge. This has implications for water depth in the wetland with small changes in water level resulting in large areas being flooded or drained. The wetland is generally shallow, averaging 0.5 m in depth.

Lake Crescent has been artificially manipulated since the 1830's. Dams, gates, sluices and canals have since been installed to regulate water flow from the lake to secure a sufficient supply to downstream users via the Clyde River (Cutler 1990). Since then, the water level within the lake has been raised on a number of occasions.

Water is regulated between the two lakes via a gate at the south end of Lake Sorell (northern end of the Interlaken canal). Water is supplied to the downstream users by releasing water at the gate at the junction of the Clyde River and Lake Crescent.

Water loss from the Lake Crescent and Sorell system occurs primarily as evaporation due to the large surface area and shallow nature of the lakes, with releases for irrigation and town supply contributing a much smaller loss.

Lake Crescent's water level generally follows a pattern of high levels responding to high rainfall events during winter and spring with low levels occurring during summer due to high evaporation rates. Due to its small catchment, Lake Crescent is largely dependent on water from the Lake Sorell catchment to maintain levels. Greatest demand for water usually occurs between November and April when irrigation is at its peak. In the last few years, low lake levels have persisted due to low rainfall and high evaporation, reaching record low levels. As a result the Interlaken Lakeside Reserve has not received water from Lake Crescent since summer 1997, causing concern for the aquatic vegetation communities within the wetland. High rainfall events since the summer of 1997 have resulted in some water ponding in the wetland stimulating some plant growth.

1.8. Adjacent land use

The majority of the land adjacent to the Interlaken Lakeside Reserve is privately owned and has been cleared for agriculture. The agricultural land is principally used for sheep and cattle grazing. A housing sub-division of 64 lots was developed in 1988 along the western shoreline of the reserve. At this time, a river reserve was also established between the sub-division and the Lakeside Reserve.

2. Vision and Objectives for the Reserve

2.1. The vision for the Reserve

The Interlaken Lakeside Reserve continues to support diverse assemblages of aquatic vegetation and provides important habitat for macroinvertebrates, frogs, fish, particularly the threatened golden galaxias (*Galaxias auratus*) and waterbirds.

European carp (*Cyprinus carpio*) populations have been eradicated or reduced in the system and pest plants do not pose a threat to native vegetation.

Visitors enjoy the reserve for its quietness and relaxed and uncrowded atmosphere, and appreciate the scenic natural landscapes.

Visitors pursue recreation based on the features and values of the reserve, without undue disturbance to flora and fauna and without disturbing or detracting from the experiences of other visitors.

Recreation and tourism facilities are discretely located and do not threaten the environmental, heritage or recreational values of the reserve.

2.2. Management objectives

In accordance with the *Crown Lands Act 1976*, the current management objectives for a public reserve aim:

- to conserve natural biological diversity;
- to conserve geological diversity;
- to preserve the quality of water and protect catchments;
- to conserve sites or areas of cultural significance;
- to encourage education based on the purposes of reservation and the significance of the public reserve;
- to encourage research, particularly that which furthers the purposes of reservation;
- to protect the public reserve against, and rehabilitate the public reserve following, adverse impacts such as those of fire, introduced species, diseases and soil erosion on the public reserve's natural and cultural values and on assets within and adjacent to the public reserve;
- to encourage tourism, recreational use and enjoyment consistent with the conservation of the area's natural and cultural values;
- to encourage cooperative management programs with Aboriginal people in areas of significance to them in a manner consistent with the purposes of reservation and the other management objectives;
- to provide for the taking, on an ecologically sustainable basis, of designated game species for commercial or private purposes, or both;
- to provide for the controlled use of natural resources;
- to provide for exploration activities and utilisation of mineral resources;
- to allow for private, commercial or industrial uses.

Under the Convention on Wetlands (Ramsar, Iran, 1971), the primary objective for the Ramsar site is:

- to ensure the wise use and conservation of wetlands because of their abundant richness in flora and fauna and the economically important functions and values.

The management objectives for the reserve aim to encourage use of the wetland in a responsible and sustainable manner whilst protecting and conserving existing environmental values. Specific management objectives are outlined below. These objectives are fundamental to the long-term protection of the reserve.

Specific management objectives for the Interlaken Lakeside Reserve are to:

- conserve threatened species, habitats and communities of conservation significance, particularly those for which the area has been designated as a Ramsar site;
- seek to ensure that water quality and quantity is adequate to maintain natural systems;
- conserve areas of cultural significance;
- protect and retain the recreational and tourism values of the reserve;
- provide recreation and tourism opportunities and facilities based on appreciation and enjoyment of the natural, heritage, recreational and educational values;
- enrich visitor experiences of the reserve values through education and interpretation;
- develop public understanding and support of the values and goals for the management of the reserve and
- co-operate with neighbours and all users in managing the reserve.

3. Wetland Policy Framework

3.1. The Ramsar Convention

The Convention on Wetlands (Ramsar, Iran, 1971) is an intergovernmental treaty, which provides the framework for international co-operation for the conservation and wise use of wetlands. It is the first of the modern global treaties on conservation and wise use of natural resources. The Convention, which is commonly referred to as the Ramsar Convention, takes its name from the Iranian city of Ramsar where the treaty was adopted in 1971. The official name of the treaty – *The Convention on Wetlands of International Importance especially as Waterfowl Habitat* – reflects its original focus on the conservation and wise use of wetlands primarily to provide habitat for waterbirds. However, since its conception, the Convention has developed further to include all areas of wetland conservation and wise use (Ramsar 2002).

Under the Convention of Wetlands, wetlands are considered as ‘areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters’ (Ramsar 2002).

There are presently 132 Contracting Parties to the Convention, with 1178 wetland sites, totalling 102.1 million hectares, designated for inclusion in the list. Control and responsibility of the sites remains with the countries within which the sites are located (Ramsar 2002).

Management of the Ramsar sites should be in accordance with the duties and obligations of signatories to the Convention. In particular, Article 3.1 states that the Contracting Parties “shall formulate and implement their planning so as to promote the conservation of wetlands included in the list, and as far as possible the wise use of wetlands in their territory”.

Australia was one of 18 nations to first become a Contracting Party to the Convention in 1971. Australia now has 57 sites (at August 2001) covering an area of more than five million hectares. Ten of these 57 sites are located in Tasmania. The Interlaken Lakeside Reserve was listed as a Ramsar site under the Ramsar Convention in 1982 (refer to Section 1.3).

Australia’s obligations under the Ramsar Convention are primarily met through legislation and administration arrangements governed by the State and Territory Governments.

3.2. Migratory Birds Agreement

As a signatory to both the Japan-Australia and China-Australia Migratory Bird Agreements (JAMBA/CAMBA) and as a member of the East-Asian-Australasian Shorebird Site Network (EAASSN), Australia has obligations to ensure the protection of migratory bird species and their habitats. Five species of migratory birds, protected under the JAMBA and CAMBA agreements, utilise the Interlaken Lakeside Reserve as outlined in Section 4.2.

3.3. Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act 1999*) provides a national legislative framework for the protection and management of Australia's Ramsar wetlands and listed migratory bird species. Under the *EPBC Act 1999*, wetlands are potential sites with values of National Environmental Significance (NES). The Act defines three such matters of NES that apply to the Interlaken Lakeside Reserve. These are:

- Ramsar wetlands of international significance
- Listed threatened species and ecological communities
- Listed migratory species

The *EPBC Act 1999* is in place to enhance the management and protection of Australia's Ramsar Wetlands and migratory birds through the application of consistent management principles and more robust Commonwealth/State arrangements (EA 2002).

In order to protect and manage threatened species and threatened ecological communities, the *EPBC Act 1999* (EA 2002) provides for:

- identification and listing of threatened species and threatened ecological communities;
- development of recovery plans for listed species and ecological communities;
- recognition of key threatening processes and where appropriate
- reducing these processes through threat abatement plans.

3.4. Commonwealth Wetlands Policy

In 1997, the Wetlands Policy of the Commonwealth of Australia was developed as a part of Australia's obligation to protect and manage wetlands under the Ramsar Convention.

The Wetlands Policy, and the strategies it details, seeks to ensure that the activities of the Commonwealth Government promote the conservation, ecologically sustainable use and where possible enhancement, of wetland functions (EA 1997).

The development of this policy was inspired by the Ramsar Convention to promote the wise use principle and develop guidelines for its application. The policy demonstrates that Australia's Commonwealth Government recognises the special role of wetlands in the well-being of present and future generations of Australians and is committed to the management of wetland resources for the enjoyment and benefit of all (EA 1997).

The Wetlands Policy is administered by the Commonwealth Government, who is committed to the implementation of this policy which is viewed as an important step towards the development of a national framework of wetland policies and strategies (EA 1997).

3.5. Tasmania's Nature Conservation Strategy

Tasmania's Nature Conservation Strategy has been developed as an action plan to protect Tasmania's natural diversity and maintain ecological processes and systems (DPIWE 2001b). The strategy identifies wetlands as important areas to protect and restore and has actioned to 'endorse the draft Wetlands Strategy and ensure that it has legislative support in line with national and international obligations' (DPIWE 2001).

3.6. Tasmanian Wetlands Strategy

A Wetlands Strategy for Tasmania is currently being developed and was due for release during 2002. A Draft Discussion Paper (DPIWE 2000) has been prepared to aid in the development of the Wetlands Strategy. The aim of the Strategy is to raise public awareness of the values of wetlands and the threats to them, and to provide strategic direction and a concerted response to those threats (DPIWE 2000).

Wetlands of international, national and state significance will be identified as a part of the Wetlands Strategy. Within Tasmania, there are currently 10 wetlands listed under the Ramsar Convention, 89 (including Ramsar sites) as wetlands of national importance (EA 2001) and a further 59 as wetlands of state significance.

3.7. Draft Threatened Species Strategy for Tasmania

The Draft Threatened Species Strategy was developed in 1998 (DPIWE 1998) to help conserve threatened flora and fauna species and ecological communities and identify threatening processes. Many wetlands within Tasmania play a vital part in protecting and conserving threatened species. Wetlands that have been identified as critical habitat for the survival of a threatened species or community should be protected and managed under the terms of the Draft Threatened Species Strategy. Two threatened plant species and one threatened fish species are known to occur within the Interlaken Lakeside Reserve.

3.8. Regional policies and plans

On a regional level, the protection and conservation of wetlands is also being addressed in the Derwent Catchment Natural Resources Management Plan (Andrew 2002) and the future Lakes Sorell and Crescent Catchment Management Plan (Deakin¹, pers. comm.).

1. Jenny Deakin, Lakes Sorell and Crescent Rehabilitation Project, Inland Fisheries Service, Tas

4. Reserve Conservation

4.1. Flora

The Interlaken Lakeside Reserve supports diverse assemblages of aquatic macrophytes. The plant communities within the wetland are dominated by *Baumea arthrophylla* (soft twig-rush) and *Triglochin procerum* (water ribbons) associated with *Villarsia reniformis* (running marsh-flower), *Isolepis fluitans* (floating club-rush), *Myriophyllum simulans* (common milfoil) and *Potamogeton tricarinatus* (floating pondweed).

The earliest assessment of aquatic vegetation within the Interlaken Lakeside Reserve was conducted during wet conditions, by Kirkpatrick and Harwood (1981) as part of their survey of Tasmanian wetlands during 1978-80. The most recent survey was conducted throughout the summer months of 2000/01 by Heffer (2003) during a study of the Lakes Sorell and Crescent wetlands as part of the current Lake Sorell and Crescent Rehabilitation Project. The wetland was dry at the time of the recent survey. A complete list of the plant species recorded in the Interlaken Lakeside Reserve during both studies appears in Appendix 3. A flora survey of the terrestrial section of the reserve has not yet been undertaken.

The key difference between the two surveys was the number of species that were recorded. 48 species were found during the recent survey compared to 14 recorded in 1981. Changes in the abundance, distribution and composition of the aquatic vegetation communities have probably occurred due to variations in prevailing water regimes. An increase in the number of introduced species, predominantly pasture grasses, that have encroached on the wetland is likely to be due to the recent low water levels and dry periods. These species were relatively low in abundance and it is likely that they will not be a major threat to the native species when an adequate water regime is introduced. Additionally, the decline in abundance (% cover) of aquatic species identified during the recent 2000/01 survey compared with the earlier study was probably also caused by the drier conditions. A reasonable presence of charophytes were recorded in the Interlaken Lakeside Reserve during the 1981 survey (Kirkpatrick & Harwood 1981) when the wetland was wet and were not observed in the recent survey due to the wetland being dry. Charophytes are macro-algae species that do not usually tolerate drying (Brock & Casanova 2000).

An assessment of the aquatic vegetation within the wetland when it is fully inundated would give a truer indication of the specific changes that have occurred within the vegetation communities.

Significant Flora

Kirkpatrick and Harwood (1981) recorded the presence of *Amphibromus neesii* (swamp wallaby-grass) and *Isolepis montivaga* (mountain isolepis) within the Interlaken Lakeside Reserve. Both are considered rare with *A. neesii* being listed under the Tasmanian *Threatened Species Protection Act 1995*. *I. montivaga* was also recorded during the most recent survey (Heffer 2003). *I. montivaga* was low in abundance in 1981 (Kirkpatrick & Harwood 1981) and still remains sparse. A few plants resembling *A. neesii* were observed, but due to low water levels in the wetland, the species failed to seed so an accurate identification was not possible.

Threats

The key threats impacting on the wetland and consequently its flora and fauna are discussed further in Sections 5 and 6. The threats include altered water regimes, introduced fauna, weeds, recreation and potential pollution from adjacent housing developments.

Recommendations

- Maintain a water regime within the wetland to retain diversity of aquatic plant species (see Section 5.2);
- Monitor aquatic vegetation regularly with particular reference to water levels and introduced species;
- Confirm identification of the threatened species, *Amphibromus neesii* and determine its current distribution;
- Monitor, prepare and implement management programs for threatened flora species and communities of conservation significance to ensure their survival;
- Undertake a floral assessment of the terrestrial section of the Interlaken Lakeside Reserve;
- Minimise non-natural disturbance of vegetation to protect flora values and limit the risk of introducing pests, weeds and pathogens.

4.2. Fauna

The Interlaken Lakeside Reserve contains a diverse range of fauna species including significant species which inhabit the shallow, freshwater wetland. These species have been extensively studied as part of the IFS Lakes Sorell and Crescent Rehabilitation Project (Hardie 2003a,b). A comprehensive fauna survey for the terrestrial section of the reserve has not been undertaken, however species that have been observed within the general Lake Sorell and Crescent area are likely to also be found within the reserve. A list of fauna species that have been observed both historically and recently within the Interlaken Lakeside Reserve and the lakes Crescent and Sorell area is presented in Appendix 4.

Assessments of the benthic and littoral macroinvertebrate communities within Lake Crescent have previously been undertaken by Fulton (1983), Leonard (1974) and Timms (1978). Most recently (2001/02), a study has been undertaken by the IFS as part of the aquatic fauna component of the Lakes Sorell and Crescent Rehabilitation Project (Hardie 2000a, b). Unfortunately, due to low water levels and dry conditions within the Interlaken Lakeside Reserve during 2001-02, the macroinvertebrate species inhabiting the wetland could not be surveyed. However, macroinvertebrates residing in the nearby Kemps Marsh were studied and it is considered that similar communities will be present within the Interlaken Lakeside Reserve (Hardie², pers. comm.). A list of macroinvertebrates for Kemps Marsh is listed in Appendix 5. It has

2. Scott Hardie, Lakes Sorell and Crescent Rehabilitation Project, Inland Fisheries Service, Tas.

been noted that there is a large difference between the types of species present within the wetlands and those recorded in the main lakes. The wetland provides important habitat for many species of macroinvertebrates, including the hydrobiid gastropod (*Austropyrgus* sp.), which is endemic to lakes Sorell and Crescent (Cleary 1997).

Three species of frogs have recently been observed in the Interlaken Lakeside Reserve – the common froglet (*Crinia signifera*), eastern banjo frog (*Limnodynastes dumerilii*) and the brown tree frog (*Litoria ewingi*) (B. Mawbey³, pers. comm.). Anecdotal reports suggest that the frog populations have declined over the years. This is thought to be due to the lack of water in the wetland.

The green and golden frog (*Littoria raniformis*) has previously been observed in the wetland (B. Mawbey, pers. comm.). This species of frog is currently listed as ‘vulnerable’ under the Tasmanian *Threatened Species Protection Act 1995*. Historically, the spotted marsh frog (*Limnodynastes tasmaniensis*) has also inhabited the reserve, however this species too, has not been observed in the wetland in recent years (B. Mawbey, pers. comm.).

Large numbers of tiger snakes (*Notechis scutatus*) have previously been observed in the area including the Interlaken Lakeside Reserve when water levels are high and there is an abundant supply of frogs (their major prey item) in the wetlands (B. Mawbey, pers. comm.) An investigation of the ecology and feeding behaviour of the Tasmanian tiger snake (*N. scutatus*) by Dredge (1981) found that much larger numbers of snakes were found near the edges of swampy areas compared with more densely forested areas. Since the wetland has been dry over the past few years, frog numbers have decreased and consequently, the numbers of snakes in the area have declined dramatically.

Lake Crescent supports populations of both native and introduced fish species. The management of freshwater fish species in Tasmania is the responsibility of the IFS. At times when the lake level in Lake Crescent is high and the Interlaken Lakeside Reserve is full, the wetland becomes an important habitat for a native fish – the golden galaxias (*Galaxias auratus*). The golden galaxiid holds significant conservation value, as this small, native, freshwater fish is endemic to lakes Sorell and Crescent and their associated streams and wetlands. The golden galaxiid is currently listed by the Australian Society for Fish Biology as ‘restricted’, ‘rare’ under the Tasmanian *Threatened Species Protection Act 1995* and ‘endangered’ on the IUCN Red List (ASFB 1999). Golden galaxiids use the wetland for feeding, shelter and possibly spawning (Hardie 2003). The wetland is thought to also provide an important nursery area for juvenile golden galaxiids (R. Mawbey⁴, pers. comm.). A listing statement and management strategy has been prepared for the golden galaxiid (Hardie 2003b; TSU in press).

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3. Brett Mawbey, Lakes Sorell and Crescent Rehabilitation Project, Inland Fisheries Service, Tas.
 4. Ron Mawbey, Aquenal Pty. Ltd., Tas.

A population of the short-finned eel (*Anguilla australis*) exists within Lake Crescent. The establishment of dams and barriers within the catchment and fine mesh screens on the Clyde River outlet has blocked the natural spawning migration of eels between the lake and the ocean which is essential to sustain the population. The eel population in Lake Crescent is managed as a commercial fishery, which is currently maintained by the stocking of elvers by the IFS. When the wetland water levels are high, eels from Lake Crescent use the Interlaken Lakeside Reserve for its plentiful food supply (B. Mawbey, pers. comm.)

Interlaken Lakeside Reserve and nearby lakes and wetlands have historically supported high numbers of waterbirds including swan and ducks. Numbers over recent years have declined due to the recent drought period and subsequent low water levels.

Despite low water levels, black swan (*Cygnus atratus*), masked lapwing (*Vanellus miles*), Latham's snipe (*Gallinago hardwickii*), red-capped plovers (*Charadrius ruficapillus*), white-faced heron (*Egretta novaehollandiae*) and swamp harriers (*Circus approximans*) have recently been observed feeding in the Interlaken Lakeside Reserve.

The wetlands of lakes Sorell and Crescent are also an important feeding and refuge area for waterbirds in times of drought. When water levels are high in lakes Sorell and Crescent, it is believed that waterbirds such as ducks, swans and cormorants use the wetland when nearby wetlands in the Midlands (such as the Ellenthorpe Lagoon complex), periodically dry out (Blackhall⁵, pers. comm.).

Five migratory bird species, the great egret (*Ardea alba*), cattle egret (*Ardea ibis*), Latham's snipe (*Gallinago hardwickii*), white-bellied sea eagle (*Haliaeetus leucogaster*) and the caspian tern (*Sterna caspia*), which are protected under the JAMBA and CAMBA, have used the Interlaken Lakeside Reserve for feeding and resting in the past. It is likely that upon an increase in lake level and refilling of the wetland, waterbirds will return to the area in high numbers.

Threats

The threats to the fauna in the wetland include the potential loss and/or damage of habitat through inadequate water level management, recreational activities and introduced pests. These issues are outlined in Sections 5 and 6.

5. Stewart Blackhall, Nature Conservation Branch, Department of Primary Industries, Water and Environment, Tas.

Recommendations

- Undertake a survey of the fauna and communities within the terrestrial section of the reserve;
- Ensure aquatic flora values are retained through an appropriate water regime to maintain habitat for aquatic fauna;
- Implement the management requirements established in the listing statement and management plan for the golden galaxias (*Galaxias auratus*) (Hardie 2003b) and macroinvertebrate plan (Hardie 2003a);
- Monitor numbers and breeding success of waterbirds;
- Minimise disturbance to wildlife, particularly during their breeding times, caused by recreational activities;
- Provide information and education to visitors on minimising impacts on waterbird breeding.

4.3. Water quality

Water quality within the Interlaken Lakeside Reserve has not been directly assessed although a study into the water quality of the entire lakes catchment has recently been conducted (Uytendaal 2003). The quality of water in Lake Crescent is currently quite degraded. In recent years there has been a major shift in the water quality, particularly turbidity, within Lake Crescent, due principally to low water levels. The lake is a large, shallow basin that is exposed to prevailing winds, which allows wind-generated resuspension of the bottom sediments to cause high turbidity. At low lake levels, these conditions have been exacerbated resulting in extremely high turbidity levels within the lake. An increase in water level within Lake Crescent reduces turbidity by limiting disturbance of sediments from wind-generated resuspension (Uytendaal 2003). Improvement of the water quality within the lake is likely to be beneficial to the wetland, especially at times when the wetland fills from the lake. Guidelines have been developed to address the issues associated with the decline in water quality within lakes Crescent and Sorell (Uytendaal 2003) and recommend maintaining and operating water levels in Lake Crescent above 802.7 m AHD to aid in the improvement of turbidity levels within the lake.

Historically, Lake Crescent has been described as a productive lake with moderate nutrient and turbidity levels and is considered as a turbid-phytoplankton dominated system (Cheng & Tyler 1973). Cheng and Tyler (1973) reported that Lake Crescent had a phytoplankton biomass 10 times that of the neighbouring Lake Sorell, which was interesting considering both lakes have similar morphometry, climate, geology, soils and vegetation in their catchments. The mechanisms controlling these differences are currently under investigation by the IFS.

In comparison to the main lake, water within the wetland is usually relatively clear and based on nearby, similar wetlands, nutrient levels are relatively low. The wetland is thought to act as a sink that takes up nutrients and settles out sediments from water before it enters Lake Crescent (Uytendaal⁶, pers. comm.).

6. Adam Uytendaal, Lakes Sorell and Crescent Rehabilitation Project, Inland Fisheries Service, Tas.

Water in Lake Crescent and the wetland may be contaminated from septic tanks systems in the adjacent housing sub-division if they are not maintained properly. This issue is addressed in Section 5.7. Run-off from adjacent agricultural properties potentially carrying high nutrients and other chemicals may also contribute to a decrease in the water quality within the wetland.

The protection of the quality of Tasmania's water resources is important to securing the State's future. To ensure adequate levels of protection, the *State Policy of Water Quality Management 1997* now requires that protected environmental values (PEVs) and water quality objectives (WQOs) are set for all surface waterbodies around the state. The Interlaken Lakeside Reserve was identified as a specific community water value during the recently conducted community consultation process (DPIWE 2001a). This has led to a set of PEVs which recognise that the system is pristine or nearly pristine and is used for primary (eg. swimming) or secondary (eg. fishing) contact activities. WQOs which are a set of water quality standards or targets which will maintain the PEVs, are to be determined in the future. This plan contains recommendations for the level of protection to be given to the surface waters of the Interlaken Lakeside Reserve.

Recommendations

- Assess and determine baseline water quality levels within the wetland;
- Determine the impact of the wetland on nutrient input into Lake Crescent;
- Maintain and operate water levels in Lake Crescent above 802.7 m AHD to aid in the improvement of turbidity levels within the lake;
- Liaise with organisations such as DPIWE, Central Highlands Council, Hydro, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Waterwatch, the University of Tasmania and community groups to develop and implement monitoring strategies;
- Liaise with adjacent landholders to minimise potential runoff of sediment, pesticides and fertilisers, livestock grazing and other agricultural activities and encourage regeneration of vegetation along fringes of the wetland;
- In co-operation with relevant agencies, council and community groups, manage the reserve to maintain and enhance water quality as designated by Protected Environmental Values and Water Quality Objectives.

4.4. Aboriginal heritage

Aboriginal people have lived in Tasmania continuously for at least the last 37 000 years. History of Aboriginal existence in the Lake Crescent area remains unclear. However, incidences of clashes between aborigines and white settlers in the Lake Crescent and Sorell area between the 1820's and 1830's have been documented (Plomley 1966, 1992).

A brief archaeological survey was undertaken at Lake Crescent in 1986 (Thomas and Associates 1986) as part of an environmental impact study to determine the impacts of raising the water level of the lake (Chilcott 1986). Eight Aboriginal sites were identified along the shoreline of Lake Crescent. Three of the sites were located along the shoreline of the Interlaken Lakeside Reserve (Thomas and Associates 1986).

Recommendations

- Conduct further surveys for Aboriginal heritage in co-operation with the Aboriginal community. Develop and implement protection strategies to identify and conserve such sites;
- Consult with the Aboriginal community on the management of Aboriginal heritage;
- Assess and protect Aboriginal heritage values in accordance with both the management objectives and recommendations of this management plan and any agreed national or state charter or guidelines for Aboriginal places;
- Do not publicise Aboriginal places unless the place has been assessed, in co-operation with the Aboriginal community, for educational or interpretive use. Where applicable, make use of any agreed Aboriginal interpretation strategy;
- Develop interpretation of the Aboriginal heritage in consultation with the Aboriginal community;
- Consult the Aboriginal community on any taking or development that may impinge on Aboriginal sites;
- Report all Aboriginal relics discovered to the Director in accordance with the *Aboriginal Relics Act 1975*;
- Monitor Aboriginal places for, and protect from, damage.

4.5. Values within adjacent areas

Clyde Marsh (south-west Lake Crescent) and Robertsons Marsh (north-west Lake Sorell) are both areas of unallocated Crown Land that are also important wetlands consisting of diverse assemblages of macrophytes, macroinvertebrates, frogs and waterbirds. These wetland areas are considered to be equally important in maintaining biodiversity in the area and in the protection and conservation of threatened flora and fauna species. These two areas have been included in the reservation application for consideration as Conservation Areas. Refer to Section 5.1. Inclusion of Clyde Marsh into the Ramsar site should also be considered in order to extend the protection and conservation of the wetland dependant flora and fauna of Lake Crescent.

Recommendations

- Pursue reservation of adjacent Crown Land areas as Conservation Areas in conjunction with the reservation of the Interlaken Lakeside Reserve (See Section 5.1);
- Assess feasibility of including Clyde Marsh into the Ramsar site listing.

5. Reserve Protection

5.1. Reservation

Given the importance of the reserve at an international level, the maximum protection possible under state legislation is necessary in order to recognise, protect and conserve those internationally significant values. Currently, the Interlaken Lakeside Reserve is not reserved under the schedules of the Tasmanian *National Parks and Wildlife Act 1970*.

In 1988, Kirkpatrick and Tyler identified limited reservation (only 1 State Reserve) of shallow, freshwater marshes within Tasmania. The marshes associated with Lakes Sorell and Crescent, including the Interlaken Lakeside Reserve, are some of the largest areas of shallow freshwater marshes in Tasmania. None of these marshes are currently reserved. In light of this and given the important conservational values that exist within all of the Crown Land wetlands associated with lakes Crescent and Sorell, a proposal has been made to list these areas as Conservation Areas. An application was submitted in June 2001 to the NCB requesting that the Interlaken Lakeside Reserve, Clyde Marsh, Robertsons Marsh and Lake Crescent and Sorell be considered for reserve status. An approval or rejection of this application is due mid-2003.

Under the terms of the *National Parks and Wildlife Act 1970*, the name "Conservation Area" is applied to an area of land predominantly in a natural state but mining, and in some cases, hunting may be permitted (PWS 2002a).

The management objectives of Conservation Areas are (PWS 2002a):

- to conserve natural biological diversity;
- to conserve geological diversity;
- to preserve the quality of water and protect catchments;
- to conserve sites or areas of cultural significance;
- to provide for the controlled use of natural resources;
- to provide for exploration activities and utilisation of mineral resources subject to appropriate controls;
- to provide for the taking, on an ecologically sustainable basis, of designated game species for commercial or private purposes, or both;
- to provide, in special circumstances, for other small-scale commercial or industrial uses;
- to encourage education based on the purposes of reservation and the natural or cultural values of the Conservation Area, or both;
- to encourage research, particularly that which furthers the purposes of reservation;
- to protect the Conservation Area against, and rehabilitate the Conservation Area following, adverse impacts such as those of fire, introduced species, diseases and soil erosion on the Conservation Area's natural and cultural values and on assets within and adjacent to the Conservation Area;
- to encourage appropriate tourism, recreational use and enjoyment consistent with the conservation of the Conservation Area's natural and cultural values and

- to encourage cooperative management programs with Aboriginal people in areas of significance to them in a manner consistent with the purposes of reservation and the other management objectives.

Changing the reserve status for the area would help to give shallow, freshwater marshes and the threatened flora and fauna that inhabit them, more protection under the *National Parks and Wildlife Act 1970*. Under the current Act, *Crown Lands Act 1976*, the reserve status and management recommendations can be subject to revocation whilst under the *National Parks and Wildlife Act 1970* it is more difficult.

Recommendations

- Recognise the lack of reservation of shallow, freshwater wetlands within Tasmania;
- Support the proposal for listing the Interlaken Lakeside Reserve as a Conservation Area under the *National Parks and Wildlife Act 1970*;
- Include nearby Crown Land wetlands, Clyde Marsh and Robertsons Marsh and Lakes Crescent and Sorell in the reservation application.

5.2. Altered water regimes

Lake Crescent has been artificially manipulated since the 1830's. Dams, gates, sluices and canals have been installed to regulate water flow from the two lakes to secure a sufficient supply to downstream users (Cutler 1990). Consequently, water regimes within the Interlaken Lakeside Reserve have been altered for some time.

Water levels in Lake Crescent have declined over the past 30 years with water levels reaching record low levels and remaining low for the past 4-5 years. This has been primarily due to recent drought conditions. As a result, the wetlands have not been fully inundated from the lakes for five consecutive years. Extensive dry periods can have significant impacts on the aquatic plant species composition and abundance within wetlands.

The main impacts on the wetland associated with extended dry periods are the introduction of exotic pasture grasses and weeds and possible depletion of the seed bank. High rainfall events in the dry wetland have stimulated seed germination by moistening the soil. Without subsequent inundation from Lake Crescent, the wetland dried out before plants had the opportunity to complete their lifecycle. As a result, seeds within the seed bank have been used but not replaced. This could be detrimental to the survival of a species in the wetlands, particularly those species that rely heavily on the seed bank for continued existence (Heffer 2003).

It is unrealistic to try to return the water regime exactly back to its 'natural' state as human activity has made changes to the Lake Crescent system over the past century, which are difficult to reverse. Instead, it is important to get a feel for how the system has operated recently and try to manage water levels to protect the wetlands as they exist today and for the future. A study investigating the wetland water levels and the response of the vegetation to determine cycles or patterns in the water regime (Heffer 2003) has also been undertaken on the wetlands of lakes Crescent and Sorell as part of the Lakes Sorell and Crescent Rehabilitation Project.

An optimum water regime has been recommended for the Interlaken Lakeside Reserve through the IFS wetlands study (Heffer 2003). This wetland water regime will be managed through a water management plan, under the *Water Management Act 1999*. The water management plan is currently being developed by IFS and DPIWE and is due for release by mid-2003 (Deakin, pers. comm.).

Maintenance of an appropriate water regime for the Interlaken Lakeside Reserve wetland will help to conserve and retain its unique flora and fauna values, particularly the aquatic vegetation.

Recommendations

- Maintain or seek to restore appropriate water regimes in accordance with the requirements established in the wetland management plan for Lakes Sorell and Crescent, that is:
 - Ensure wetlands are not kept permanently full – no longer than 5 consecutive years;
 - Ensure wetlands do not dry out for any longer than 5 consecutive years;
 - The wetlands are required to be inundated to a level of 300 mm at least once every 5 years;
 - Ensure a drying phase is included into the water regime with dry:wet cycles coinciding with climatic events;
 - Fluctuations of water levels should occur annually;
 - Flooding should occur gradually;
 - Inundation should be at its peak during spring/early summer;
 - Water should remain in the wetlands until late summer;
- Recommend monitoring water level changes within the wetlands on a monthly basis;
- Recommend monitoring changes in wetland vegetation annually with respect to water level;
- Review the water regime for the wetland in 5 years time.

5.3. Grazing

Cattle and sheep have grazed the Interlaken Lakeside Reserve continuously for at least half a century. A licence to graze livestock on the wetland was granted in 1956 to the landholder owning the neighbouring property. In December 2001, the boundary between this property and the reserve was fenced. The IFS erected 1.6 km of fencing along the Interlaken Lakeside Reserve boundary, as part of the Lakes Sorell and Crescent Rehabilitation Project. The fence was funded by the Inland Fisheries Service (IFS) and Crown Land Services (CLS). Assistance in erecting the fence was provided by anglers, local shack owners, Conservation Volunteer Australia volunteers (through the Revive Our Wetlands program), DPIWE and IFS staff. Negotiations between IFS, CLS and the adjacent landholder resulted in the landholder agreeing to cancel the grazing licence on the wetland for conservation outcomes. The grazing licence for the Interlaken Lakeside Reserve was subsequently cancelled in April 2002 and grazing has ceased.

Benefits of removing grazing from wetlands include (DNRE 1996; Robertson 1997):

- Reduced nutrient input via pugging of the soil and defecation by livestock which in turn, reduces the potential for algal blooms;
- Reduced impact on wetland plant species through direct consumption and trampling by livestock;
- Reduced incidence of cattle getting trapped in the wetlands when wet;
- Reduced spread and introduction of exotic plant species.

Recommendations

- No future grazing by domestic livestock is to be permitted on the Interlaken Lakeside Reserve;
- Undergo regular maintenance checks on the boundary fences to ensure livestock from adjacent properties cannot accidentally graze the wetland and liaise with neighbouring landowners about the need to upgrade and maintain boundary fences;
- Maintain liaisons with CLS to ensure licences are not granted for grazing on the wetland.

5.4. Introduced Fauna

European carp (*Cyprinus carpio*) were discovered in lakes Crescent and Sorell during 1995, raising concerns for the future of the trout fishery and native fish populations in the lakes. It is thought that the European carp were introduced during the 1980's. Since their discovery, the IFS has been working towards containing and eradicating this exotic fish species and has been successful in reducing the populations in both lakes. In their present low numbers, European carp do not pose a big threat to the Interlaken Lakeside Reserve. However, if the population was to increase significantly, this could have a detrimental impact on the wetland, particularly the aquatic vegetation. European carp commonly feed along the bottom substrate taking in soft plant matter and detritus (McDowall 1996). In high densities, carp may cause severe damage to wetland vegetation.

Brown trout (*Salmo trutta*) and rainbow trout (*Onchorynchus mykiss*) were introduced into Lake Crescent during 1868 and 1922, respectively for recreational fishing. Since then, the lake has maintained productive trout populations, particularly brown trout, boasting numbers of 'trophy' fish weighing up to 10 kg (IFS unpublished data). Lake Crescent has minimal natural recruitment and consequently, trout populations rely on a stocking program conducted by the IFS. Trout feed and thrive in the Interlaken Lakeside Reserve when the wetland and Lake Crescent are connected.

Other introduced animal species known to occur in and around the Interlaken Lakeside Reserve include common starling (*Sturnus vulgaris*), European goldfinch (*Carduelis carduelis*), European greenfinch (*Carduelis chloris*), laughing kookaburra (*Darcelo novaeguineae*), fallow deer (*Dama dama*), feral cats (*Felis catus*), rabbit (*Oryctolagus cuniculus*), brown hare (*Lepus capensis*), and common jollytail (*Galaxias maculatus*). All of these introduced species have impacts on native species and ecosystems.

Recommendations

- Monitor introduced animal populations, undertake regular surveys of each species and investigate impacts of introduced fauna on natural values of the reserve;
- Develop and implement an integrated exotic fauna management plan;
- Control and eradication of European carp (*Cyprinus carpio*) to be continued by IFS;
- Stocking of trout in Lake Crescent to be conducted by IFS in accordance with their regulations and with consideration given to the endemic species;
- Educate the public of the harmful impacts of transporting fish between different waterbodies;
- Educate anglers and other users of the wetland and Lake Crescent about the importance of cleaning equipment (eg. boats, waders etc.) to reduce the spread of aquatic fauna eggs and other introduced species;
- New introductions of non-indigenous fauna will not be permitted without an approved comprehensive scientific assessment.

5.5. Weeds

Elodea canadensis (Canadian pondweed) was recorded in the nearby Silver Plains Marsh and Robertsons Marsh during the survey undertaken by Kirkpatrick & Harwood (1981). This species is an aquatic weed and has been declared a noxious weed within Tasmania under the *Weed Management Act 1999*. Although this species was not detected during the recent assessment of the vegetation within the Lake Crescent and Sorell wetlands (Heffer 2003), there is still cause for concern. Since the wetlands were not fully inundated by the lakes at the time of the 2000/01 survey, the conditions for germination and growth of *E. canadensis* may not have been met. Extended inundation of the wetlands may see the recurrence of *E. canadensis*. If this species was to become dominant within the wetlands of Lake Sorell or Crescent, it could out-compete native species causing a decrease in plant diversity. The potential spread of this species to the Interlaken Lakeside Reserve is possible through water releases between the two lakes and via transportation on angler's waders, boats and other equipment.

Recent dry conditions and low water levels within the wetland have encouraged undesirable species, particularly pasture grasses, thistles and other terrestrial weeds to intrude into the wetland (Heffer 2003). These species are, however, in low abundances. It is likely that upon inundation these species will not survive and the desired species tolerant of wetter conditions will dominate. Recent grazing of sheep on the wetland may have also contributed to the introduction of some of these introduced species.

Gorse (*Ulex europaeus*) is present within the dryland area of the Interlaken Lakeside Reserve, including areas that fringe the wetland. Gorse is widespread throughout Tasmania and is declared a 'secondary weed' under the *Weed Management Act 1999* (PWS 2002b). Some work has been undertaken recently by PWS to control and remove some of the gorse within the reserve (Geoghegan⁷, pers. comm.).

Effective control and management of weeds is necessary and priority targets for control need to be identified. Landowners and land managers have a responsibility to prevent weeds spreading from their land to neighbouring tenures. A natural resource management plan and catchment management plan are currently being developed for the Derwent and Lake Crescent catchments, respectively. These plans address the issue of weeds on an integrated catchment basis.

Recommendations

- Prepare and implement an action plan to eradicate or minimise impact of introduced plant species within the reserve;
- Assist with implementation of actions for weed control as outlined in regional and local catchment plans;
- Map distribution of gorse (*Ulex europaeus*) within the reserve and develop an appropriate strategy to eradicate it or minimise its impact;
- Monitor changes in aquatic vegetation to determine changes in species composition, with particular reference to Canadian pondweed (*Elodea canadensis*);
- Monitor the reserve for new invasions of exotic flora;
- Educate anglers and other users of the wetland and Lake Crescent about the importance of cleaning equipment to prevent the spread of aquatic weeds between waterbodies;
- Maintain appropriate water regimes as per Section 5.2 to reduce intrusion by introduced terrestrial species;
- Seek volunteer assistance for planned and programmed works in control and eradication of weeds;
- An integrated approach involving adjacent landholders and managers, to eradicate or control gorse (*U. europaeus*) should be sought.

5.6. *Phytophthora* protection

Phytophthora cinnamomi is a microscopic fungus, which lives in the soil and roots and causes dieback or death in a large number of Tasmanian native plant species in sedgeland, heath, open forest and disturbed rainforest.

The root rot fungus *Phytophthora cinnamomi* has not been recorded within the Interlaken Lakeside Reserve and is believed not to be present, however, ensuring this pathogen is not spread to the reserve is crucial for the survival of the native flora.

7. David Geoghegan, Senior Ranger, Parks and Wildlife Service, Department of Tourism, Parks, Heritage and the Arts, Tas.

Although the disease can spread by natural means, it is spread more rapidly and over greater distances by human activity. The disease can be spread in infected soil carried on boots, wheels and tracks of vehicles and machinery and by animals which, scratch or dig in the soil.

Except for localised infections, once an area is infected there is no known practical means to eliminate it from that area. Treatments are being trialed to determine whether the impacts may be reduced. However, these will only be practicable for treating threatened species and limited areas. Care must be taken to avoid spreading *Phytophthora* to vulnerable areas yet uninfected.

Recommendations

- Inform visitors of the *Phytophthora* threat to the reserve;
- Periodically survey the reserve for outbreaks of the disease.

5.7. Housing sub-division and shacks

A housing sub-division of 64 lots was developed in 1988 along the western shoreline of the Interlaken Lakeside Reserve. At the time, a river reserve was also established between the sub-division and the wetland edge. Several blocks were sold and holiday shacks have been built upon the sites under council approval. A council requirement for the waste management for the dwellings was the installation of a septic tank system. The sub-division is located approximately 100 m from the lake's edge, some as close as 40 m, with a strong gradient sloping towards the lake. Being in this close proximity to the wetland, there is potential for pollution of the water within the Interlaken Lakeside Reserve and Lake Crescent from these septic tank systems, if not adequately maintained.

Nine shacks exist within the Interlaken Lakeside Reserve near the Dago Point camping area, most belonging to recreational user groups such as angler associations. The shacks are currently being assessed under the *Crown Land (Shack Sites) Act 1997*.

Recommendations

- Ensure septic tanks and public toilets are maintained properly to ensure adjacent waterbodies are not polluted;
- Liaise with the Central Highlands Council to ensure no new sub-divisions are established in close proximity to the wetland;
- All shacks within the Interlaken Lakeside Reserve to be managed in accordance with conclusions of the shack categorisation process under the *Crown Land (Shack Sites) Act 1997*.

5.8. Gravel extraction

A small gravel pit is located within the Interlaken Lakeside Reserve which is used by the PWS for maintenance of the roads within the reserve. This area is not utilised by other users.

Recommendations

- Review the usage of the gravel pit and determine feasibility of closing and rehabilitating the area.

5.9. Development works

Development works can include manipulative research, construction of a road, camping area or toilet constructing or renovating buildings and installing or repairing services. Development proposals can be investigated under the *EPBC Act 1999*.

Recommendations

- All development should take in to consideration the recommendations and actions from this management plan;
- Use the best available and practicable technology to protect the environment from human impacts;
- Assess all proposals for minor works, research, or maintenance involving ground breaking, disturbance or environmental manipulation of any kind in accordance with procedures approved by the Director of National Parks and Wildlife.

5.10. Reserve boundaries

A small private property is situated within the boundary of the Interlaken Lakeside Reserve. This property covers a small section of the wetland within the reserve at the southern end. Inclusion of this property into the reserve, particular the section south of Interlaken Road, would assist in maintaining consistent management over the entire wetland.

Recommendations

- If the opportunity arises, purchase and include the private property adjacent to the eastern edge Interlaken Lakeside Reserve into the reserve;
- Consider including nearby Crown Land allotments into the proposal to reserve the area as a Conservation Area (see Section 5.1).

5.11. Leases, licences, written authorities

The following agreements provide for activities within the reserve:

- Currently there are 9 annual licences for shack sites issued under the *Crown Lands Act 1976* (see Section 5.6);
- There is a licence to fish the commercial eel fishery within Lake Crescent, issued under the *Inland Fisheries Act 1995*;
- A permit (No. TFL 00040) has been issued to IFS to undertake research on threatened flora within the wetland within the Interlaken Lakeside Reserve has issued under the Tasmanian *Threatened Species Protection Act 1995*.
- An Inland Fisheries Service Exemption Permit (IFS Permit Number 2000/31 and PWS Permit Number TFA00022) and conditions of the Department of Primary Industries Water and Environment Animal Ethics Committee (DPIWE AEC certificate number 20/2001-2002) have been issued to IFS to undertaken research on the threatened native fish, golden galaxias (*Galaxias auratus*).
- A Water Management Plan for Lake Crescent (under the *Water Management Act 1999*) is currently being developed and will facilitate the management of the water regime.

6. Visitor Management

6.1. Vehicle use and access

The Interlaken Road divides the Interlaken Lakeside Reserve and is the only access road to the reserve. All other roads and tracks within the reserve provide access to shacks, camping facilities and boat ramps and have a speed limit of 25 km/hr. Other tracks are used for PWS/IFS management purposes and are gated and locked to restrict public access. No recreational off-road vehicle activities are permitted within the reserve. All formed roads within the reserve are suitable for two wheel drive vehicles. Maintenance of these roads is currently the responsibility of the Parks and Wildlife Service.

Recommendations

- All off-road vehicle driving continues to be prohibited within the reserve;
- Vehicles are restricted to existing roads/tracks only;
- Before proceeding with any re-routing of existing tracks, the proposed route should be assessed for disease risk, habitat impacts and both species and cultural significance;
- Review responsibilities for road maintenance.

6.2. Recreation

Lake Crescent and the Interlaken Lakeside Reserve have previously been highly regarded as fishing and hunting destinations. Other recreational activities occurring within the reserve, such as camping and boating, are primarily associated with fishing and hunting. Visitation to the area has however, declined over the past few years due to a number of reasons including low lake water levels and the discovery of European carp (*Cyprinus carpio*) which have resulted in the closure of Lake Crescent to recreational and commercial activities (eg. eel fishing). Some of the activities outlined below are currently not prevalent, however upon restoration and re-opening of Lake Crescent, it is likely that this area will again become popular amongst fishing and camping enthusiasts. To maintain the diversity and uniqueness of this area, it is important to regulate recreational activities.

6.2.1. *Fishing*

Recreational Fishing

Management of the trout fishery, as well as other aquatic fauna within the reserve is the responsibility of the IFS. Natural recruitment opportunities for trout within Lake Crescent are limited, with the recreational fishery reliant upon continuous stocking.

Lake Crescent has previously been highly regarded as a premium trout fishing destination boasting numbers of 'trophy' fish weighing up to 10 kg (IFS unpublished data). The lake has previously been popular amongst many anglers, particularly bait fishermen and was one of the most popular lake fisheries in Tasmania. Angler visitation to the area were up to 11 000 during the 1993/94 angling season (Frijlink 2000).

Deterioration of the trout fishery was becoming more evident in 1995. Low water levels and resultant increased turbidity levels are thought to have contributed to the decline in the trout fishery since 1997. Following the discovery of European carp (*Cyprinus carpio*) in 1995, Lake Crescent was closed to anglers, and as a result the number of people visiting the area declined dramatically.

Potential impacts of recreational fishing include the introduction of pest fauna and flora, trampling of aquatic vegetation by large numbers of anglers wading through the wetland and disturbance of wildlife, particular waterbirds breeding in the wetland.

An assessment strategy for the re-opening of Lake Crescent is currently being developed by the IFS. The strategy outlines recommendations for re-introducing a limited season for recreational fishing in the lake. It is likely that the lake will be restricted to lure and fly-fishing only.

Commercial Fishing

Lake Crescent has supported a commercial eel fishery based on the short-finned eel (*Anguilla australis*) since 1965 (Chilcott 1986). Previously, the eel fishery was restricted to the capture of downstream migrating eels with a trap installed at the Clyde River outflow. Upon the discovery of European carp (*Cyprinus carpio*) within the lake, fine (1.1 mm) mesh screens were installed at the Clyde River outflow preventing migration of eels down the river. This has resulted in the fishery being operated using fyke nets within the lake itself. An eel trap was also installed at the Lake Sorell gate to capture eels moving from Lake Sorell to Lake Crescent but cannot be used when water levels are low (Frijlink 2000). Due to the lack of natural recruitment of eels to the system, the eel population in Lake Crescent is maintained by the stocking of elvers by the IFS.

At times when the wetland is inundated from the lake, eel fishing using fyke nets is conducted within the reserve. The impact of a commercial eel fishery on the wetland is unknown.

Recommendations

- Fishing to be permitted within the reserve in accordance with IFS regulations;
- All fish stocking within the reserve is to be carried out by the IFS in accordance with future stocking policies;
- The only recreational fish species that may be used to stock the reserve are salmoniids;
- Minimal impact wading, restricted to the wetland edges only, should be encouraged to avoid damaging vegetation and disturbing wildlife;
- Assess the long term impacts of wading on aquatic vegetation;
- Inform anglers of the importance of cleaning equipment, including waders, to avoid transferring pest plants and fish eggs;
- Liaise with the IFS on the dissemination of information to anglers;
- Assess the impact of the commercial eel fishery on the wetland.

6.2.2. Hunting

Duck shooting has traditionally been prevalent on the Interlaken Lakeside Reserve and neighbouring waterbodies. The duck season generally opens on the first weekend in March and closes on the first Sunday of June. The number of people using the reserve for this purpose is not known although since Lake Crescent was closed in 1995, duck shooting has been prohibited. Bird numbers have declined over the past few years mainly due to drought conditions and low water levels. In 1986, Blackhall, recommended that shooting be prohibited within the reserve to provide a resting area for ducks that were hunted within lakes Crescent and Sorell. Duck shooting can disturb wildlife and lead to the accidental shooting of protected species.

The use of lead shot has been conclusively linked to elevated lead levels in the State's waterfowl species (Smith 1995). The Australian and New Zealand Environment and Conservation Council (ANZECC) recommended the phase out of the use of lead shot for duck hunting Australia wide.

Consideration must be given to the State responsibilities under the Ramsar agreement (see Sections 1.3 and 3.1). In consideration of this agreement and to encourage visitation by migratory birds, it is recommended duck shooting within the reserve should be prohibited when Lake Crescent re-opens. Consultation and possible agreement with hunting groups should be sought.

Duck hunters traditionally build duck hides (small enclosed shelters), often over open water, where hunters wait for game birds. Duck hides within the reserve have been made from foreign materials and have been left to deteriorate within the wetland. In view of closing the reserve permanently to duck shooting, existing duck hides should be removed.

Wallaby and deer shooting is common in the lakes Crescent and Sorell area. Hunting for wallaby and deer is not permitted within the Interlaken Lakeside Reserve.

Recommendations

- Recommend duck shooting to be prohibited within the Interlaken Lakeside Reserve;
- If duck shooting is prohibited, existing duck hides should be removed from the reserve;
- Inform and educate shooters of the new restrictions with regard to duck hunting;
- The prohibition of wallaby and deer hunting within the reserve should remain.

6.2.3. Boating

Boating activities, both motorised and non-motorised, within the Interlaken Lakeside Reserve are primarily associated with recreational fishing. A boat ramp is located on Lake Crescent at the Clyde River outflow, just south of Tea-tree Point, at the end of Lake Crescent Road. Boating is generally limited to the main body of Lake Crescent, however, anglers have been known to enter the shallow wetlands in their boats. Motoring boats into this area has potential impacts on the wetland by severing vegetation with propellers, polluting water with fuels and oils and disturbing breeding waterbirds.

Recommendations

- The use of boats on the wetland should be restricted to unpowered vessels;
- Inform boat users of potential impacts of using motorised boats within the wetland through signage at the boat launching ramp;
- Inform visitors of the restrictions of the use of motorised boats in the reserve.

6.2.4. Bird watching and sightseeing

When water levels are high within the Interlaken Lakeside Reserve and Lake Crescent, waterbirds flock to the area to feed and breed. Bird watching has not been popular in the past but could possibly occur at certain times of the year when large numbers of birds are in the area.

6.2.5. Camping

Camping within the Interlaken Lakeside Reserve is primarily associated with recreational fishing and usually occurs between September and April (coinciding with the trout-fishing season). Campsites are located within the Interlaken Lakeside Reserve at Dago Point (refer to Map 2) and nearby at Silver Plains. Both of these areas are located adjacent to Lake Sorell. Toilets are located at both sites with showers also present at Dago Point.

In the past, camping was uncontrolled with people visiting the area camping anywhere along the foreshores of both lakes including the island within the Interlaken Lakeside Reserve. Facilities at Dago Point and Silver Plains were established in 1985 and 1993 respectively, to confine overnight visitors to designated camping areas. These camping areas are considered to be adequate to accommodate future visitors although some maintenance work may be required in view of their limited use over the past few years.

The camp ground at Dago Point consists of a long-term sites as well as temporary caravan and camping areas. Long-term camping is available during the trout fishing season on a year to year basis. Applications are made annually to the PWS to avoid permanent camps being set up. Camping may be established two weeks prior to the fishing season and can remain until two weeks after the season closes. There is currently no booking system for long-term or temporary campsites, but fees do apply to both areas. The camping fees are currently reviewed periodically.

Campfires are allowed within the reserve. Wood collection of fallen logs only is permitted within the reserve, however campers are encouraged to bring in their own wood due to a limited supply of fallen timber. Campfires are currently not confined to designated fireplaces. The feasibility of installing permanent fireplaces within the reserve is to be determined. Campfires are to be attended at all times and extinguished properly to avoid the risk of wildfire.

Dogs are presently allowed within the reserve. Dogs and other pets are capable of significantly impacting on natural values.

Rubbish bins are not provided within the reserve and visitors are required to take their garbage with them. A refuse site is located nearby on the Dennistoun Road, approximately 4 km from the camp ground.

The Clarence Anglers Club and the Tasmanian Government have established a playground within the camping ground.

A public telephone is located on Dennistoun Road, approximately 3 km away.

Recommendations

- Campers should be confined to the designated camp areas. No camping on the island is permitted;
- Recommend the establishment of permanent camp fire places;
- Encourage campers to bring in their own wood;
- Encourage minimal impact camping and use of the reserve;
- Assessment of numbers of campers in the reserve should be undertaken regularly to determine the adequacy of the facilities.
- Dogs are permitted within the reserve subject to the following minimum conditions:
 - Dogs must be on a lead and kept under close control at all times and
 - Owners must ensure there is no disturbance to wildlife and other visitors.
- No other pets are to be brought into the reserve.

6.3. Tourism

The only commercial tourism operation within the Interlaken Lakeside Reserve has been guided fishing. In the past, various trout fishing guides have used Lake Crescent. The guides were not based at the lake and would transport clients to the lake from various locations. The guides generally used the main lake rather than the wetland. It's probable that these ventures will occur again when the lake is restored to its former condition.

A historic guesthouse exists on the private land in close proximity to the reserve and Lake Sorell. Although this area has not been utilised for many years, it has recently changed ownership and it is thought that the new owners may redevelop it for recreational and/or tourism purposes.

Recommendations

- Encourage only those tourism ventures that focus on the natural and cultural values of the conservation area;
- Provide assistance and information to operators of tourism ventures so that disturbance to wildlife is minimised and visitor experience is maximised;
- Prohibit permanent tourist developments within the reserve and ensure future developments adjacent to the reserve are sympathetic with the natural environment.

7. Interpretation and Education

There are currently limited interpretation signs at the Interlaken Lakeside Reserve and the recreational and environmental potential has not been greatly promoted. Signs are needed to inform visitors of the status of the area; why this area has been reserved for conservation and why it has been recognised as a wetland of international importance. A project to produce interpretive signs for all Ramsar sites in Tasmania is underway with a sign which has been erected along main access route, on the Interlaken Road.

Signs on the Interlaken Road at each end of the reserve signify the Interlaken Lakeside Reserve area. The signs do not indicate that the area is managed by the Parks and Wildlife Service. Signs indicating information with regard to the Dago Point camp ground are located at the entrance to the camp ground and in and around the camping area. A sign outlining boating regulations and cautions is also displayed at the camp ground entrance and at each of the boat launching ramps. A sign promoting the Ramsar site has been erected on the Interlaken Road, which can be seen when entering the Interlaken Lakeside Reserve from the west.

There is potential for this area to be used in environmental education. A secondary school is located at Bothwell, and at certain times, valuable information could be gained from field trips to the wetland or from classroom projects based on lifecycles and ecological relationships evident in the area.

Recommendations

- Erect an interpretive sign along the Interlaken Road at the Lake Crescent boat ramp to provide information on:
 - the Ramsar Convention;
 - criteria for listing the Interlaken Lakeside Reserve as a Ramsar site;
 - conservation and environmental values of the reserve with particular reference to threatened flora and fauna and waterbirds;
 - appropriate recreational activities;
 - any relevant instructions;
- Inform visitors of appropriate minimal impact use of the reserve;
- Prepare and implement an interpretation plan to guide development of interpretation facilities;
- Educate and encourage visitors to adopt safe practices and provide them with sufficient information about potential hazards to enable them to make responsible decisions;
- Liaise with teachers and organisations such as Waterwatch and Landcare to encourage educational programs in the reserve;
- Seek a special relationship with the local school in developing educational programs and activities based on the particular values of the reserve;
- Consider the reserve in the context of all parks and reserves within the Central Highlands and their particular values, in developing an interpretation and education strategy.

8. Community Involvement

8.1. Community groups

Community support is critical to good management of the reserve. Angler groups which regularly use the reserve and surrounding areas are active in conservation management. Recent works include assisting in the erection of a boundary fence for the Interlaken Lakeside Reserve and water level management at the nearby Hazelwoods Lagoon.

Recommendations

- Encourage future involvement from angler groups in conservation activities;
- Develop good working relations with adjacent land managers, the local community and the Aboriginal community in matters of mutual interest;
- Liaise with the Central Highlands Council to ensure consistency, as far as possible between this plan, site plans and the municipal planning scheme.

8.2. Working with adjacent landholders

Land primarily used for agricultural purposes is located adjacent to the Interlaken Lakeside Reserve in the west and east. The waterbodies, lakes Sorell and Crescent, adjoining the reserve in the north and south are currently managed by the IFS.

Recommendations

- Regularly liaise and develop good working relations with adjacent land owners and land managers on management issues and projects of common interest;
- Develop land management practices which require off-reserve or cross-tenure implementation to protect natural values with neighbours.

9. Research and Monitoring

In order to understand ecological processes involved in maintenance of the flora, fauna and communities in the reserve it is essential that research and ongoing monitoring is conducted. Good data are necessary for informed decision making by management. Research is essential to identifying, understanding and conserving values of the reserve and sustainably managing human use.

Extensive research and monitoring has been carried out on the Lake Crescent area by IFS as part of the current Natural Heritage Trust funded Lake Sorell and Crescent Rehabilitation Project and the Fisheries Research and Development Corporation (FRDC) funded Carp Management Program over the past 2-5 years. Areas of research include water level management, water quality, aquatic fauna including the golden galaxiid and macroinvertebrates, wetlands, European carp and trout management. During this period, comprehensive baseline data has been collected in all areas (Diggle⁸, pers. comm.). Ongoing monitoring is important to determine if management actions are having a positive or negative effect on the values of the system.

Research with respect to the Interlaken Lakeside Reserve has looked at the species composition and abundance of aquatic plant species, the impact of lake water levels on the vegetation, impact of grazing by livestock on wetland vegetation and the extent of the seed bank (Heffer 2003). Specific areas that require further research include:

- Species composition and abundance of aquatic vegetation at high water levels;
- Effect of the wetland on nutrient inputs from surrounding land;
- Baseline water quality data within the wetland;
- Effect of recreation activities such as fishing on aquatic vegetation;
- The use of the wetland by golden galaxias (*Galaxias auratus*);
- Species abundance and community composition of macroinvertebrates within the wetland;
- A survey of terrestrial flora and fauna;
- A comprehensive archaeological assessment;
- An assessment of visitation within the reserve;

Recommendations

- Encourage relevant research as outlined above;
- Written approval and appropriate permits granted from DPIWE, PWS and IFS of all manipulative research proposed within the reserve is required before research begins;
- Only research that does not have long term adverse effects on the natural, cultural or aesthetic values of the reserve should be permitted;
- The approval of the Tasmanian Aboriginal community is to be obtained for any research which may impact Aboriginal heritage values.

8. John Diggle, Deputy Director, Inland Fisheries Service, Tas.

10. Review and Evaluation of Plan

This management plan sets out how the vision for the reserve will be achieved. To check the effectiveness of the management plan in doing this, indicators can be used to evaluate implementation of the plan and to check if the vision and management objectives have been achieved.

A review of the water management plan for Lake Crescent, including the water regime for the Interlaken Lakeside Reserve, is to be scheduled 5 years after it is signed off by the Minister for Primary Industries, Water and Environment, due mid-2003.

Recommendations

- Review the plan 10 years after gazettal of the Governor's approval, or earlier if research, environmental monitoring or other circumstances show this to be necessary;
- In the review of the plan, evaluate the implementation of the management recommendations and their effectiveness in achieving the vision and management objectives of the plan;
- As a minimum, use the performance indicators set out in Appendix 6 when evaluating the plan's implementation and outcomes;
- Utilise any relevant, additional monitoring and evaluation procedures developed during the period of the plan when evaluating the plan implementation and outcomes.

11. Implementation

Section	Key Recommendations from the Plan
4.1	<p>Flora</p> <p>Maintain a water regime within the wetland to retain diversity of aquatic plant species (see Section 5.2).</p> <p>Monitor aquatic vegetation regularly with particular reference to water levels and introduced species.</p> <p>Confirm identification of the threatened species, <i>Amphibromus neesii</i> and determine its current distribution.</p> <p>Monitor, prepare and implement management programs for threatened flora species and communities of conservation significance to ensure their survival.</p> <p>Undertake a floral assessment of the terrestrial section of the Interlaken Lakeside Reserve.</p> <p>Minimise non-natural disturbance of vegetation to protect flora values and limit the risk of introducing pests, weeds and pathogens.</p>
4.2	<p>Fauna</p> <p>Undertake a survey of the fauna and communities within the terrestrial section of the reserve.</p> <p>Ensure aquatic flora values are retained through an appropriate water regime to maintain habitat for aquatic fauna.</p> <p>Implement the management requirements established in the listing statement and management plan for the golden galaxias (<i>Galaxias auratus</i>) (Hardie 2003b) and macroinvertebrate plan (Hardie 2003a).</p> <p>Monitor numbers and breeding success of waterbirds.</p> <p>Minimise disturbance to wildlife, particularly during their breeding times, caused by recreational activities.</p> <p>Provide information and education to visitors on minimising impacts on waterbird breeding.</p>

Section	Key Recommendations from the Plan
4.3	<p><i>Water quality</i></p> <p>Assess and determine baseline water quality levels within the wetland.</p> <p>Determine the impact of the wetland on nutrient input into Lake Crescent.</p> <p>Maintain and operate water levels in Lake Crescent above 802.7 m AHD to aid in the improvement of turbidity levels within the lake.</p> <p>Liaise with organisations such as DPIWE, Central Highlands Council, Hydro, CSIRO, Waterwatch, the University of Tasmania and community groups to develop and implement monitoring strategies.</p> <p>Liaise with adjacent landholders to minimise potential runoff of sediment, pesticides and fertilisers, livestock grazing and other agricultural activities and encourage regeneration of vegetation along fringes of the wetland.</p> <p>In co-operation with relevant agencies, council and community groups, manage the reserve to maintain and enhance water quality as designated by Protected Environmental Values and Water Quality Objectives.</p>
4.4	<p><i>Aboriginal heritage</i></p> <p>Conduct further surveys for Aboriginal heritage in co-operation with the Aboriginal community. Develop and implement protection strategies to identify and conserve such sites.</p> <p>Consult with the Aboriginal community on the management of Aboriginal heritage.</p> <p>Assess and protect Aboriginal heritage values in accordance with both the management objectives and recommendations of this management plan and any agreed national or state charter or guidelines for Aboriginal places.</p> <p>Do not publicise Aboriginal places unless the place has been assessed, in co-operation with the Aboriginal community, for educational or interpretive use. Where applicable, make use of any agreed Aboriginal interpretation strategy.</p> <p>Develop interpretation of the Aboriginal heritage in consultation with the Aboriginal community.</p> <p>Consult the Aboriginal community on any taking or development that may impinge on Aboriginal sites.</p> <p>Report all Aboriginal relics discovered to the Director in accordance with the <i>Aboriginal Relics Act 1975</i>.</p> <p>Monitor Aboriginal places for, and protect from, damage.</p>

Section	Key Recommendations from the Plan
4.5	<p><i>Values within adjacent areas</i></p> <p>Pursue reservation of adjacent Crown Land areas as Conservation Areas in conjunction with the reservation of the Interlaken Lakeside Reserve (See Section 5.1).</p> <p>Assess feasibility of including Clyde Marsh into the Ramsar site listing.</p>
5.1	<p><i>Reservation</i></p> <p>Recognise the lack of reservation of shallow, freshwater wetlands within Tasmania.</p> <p>Support the proposal for listing the Interlaken Lakeside Reserve as a Conservation Area under the <i>National Parks and Wildlife Act 1970</i>.</p> <p>Include nearby Crown Land wetlands, Clyde Marsh and Robertsons Marsh and Lakes Crescent and Sorell in the reservation application.</p>
5.2	<p><i>Altered water regime</i></p> <p>Maintain or seek to restore appropriate water regimes in accordance with the requirements established in the wetland management plan for Lakes Sorell and Crescent, that is:</p> <ul style="list-style-type: none"> – Ensure wetlands are not kept permanently full – no longer than 5 consecutive years; – Ensure wetlands do not dry out for any longer than 5 consecutive years; – The wetlands are required to be inundated to a level of 300 mm at least once every 5 years; – Ensure a drying phase is included into the water regime with dry:wet cycles coinciding with climatic events; – Fluctuations of water levels should occur annually; – Flooding should occur gradually; – Inundation should be at its peak during spring/early summer; – Water should remain in the wetlands until late summer. <p>Recommend monitoring water level changes within the wetlands on a monthly basis.</p> <p>Recommend monitoring changes in wetland vegetation annually with respect to water level.</p> <p>Review the water regime for the wetland in 5 years time.</p>

Section	Key Recommendations from the Plan
5.3	<p>Grazing</p> <p>No future grazing by domestic livestock is to be permitted on the Interlaken Lakeside Reserve.</p> <p>Undergo regular maintenance checks on the boundary fences to ensure livestock from adjacent properties cannot accidentally graze the wetland and liaise with neighbouring landowners about the need to upgrade and maintain boundary fences.</p> <p>Maintain liaisons with CLS to ensure licences are not granted for grazing on the wetland.</p>
5.4	<p>Introduced fauna</p> <p>Monitor introduced animal populations, undertake regular surveys of each species and investigate impacts of introduced fauna on natural values of the reserve.</p> <p>Develop and implement an integrated exotic fauna management plan.</p> <p>Control and eradication of European carp (<i>Cyprinus carpio</i>) to be continued by IFS.</p> <p>Stocking of trout in Lake Crescent to be conducted by IFS in accordance with their regulations and with consideration given to the endemic species.</p> <p>Educate the public of the harmful impacts of transporting fish between different waterbodies.</p> <p>Educate anglers and other users of the wetland and Lake Crescent about the importance of cleaning equipment (eg. boats, waders etc.) to reduce the spread of aquatic fauna eggs and other introduced species.</p> <p>New introductions of non-indigenous fauna will not be permitted without an approved comprehensive scientific assessment.</p>

Section	Key Recommendations from the Plan
5.5	<p>Weeds</p> <p>Prepare and implement an action plan to eradicate or minimise impact of introduced plant species within the reserve.</p> <p>Assist with implementation of actions for weed control as outlined in regional and local catchment plans.</p> <p>Map distribution of gorse (<i>Ulex europaeus</i>) within the reserve and develop an appropriate strategy to eradicate it or minimise its impact.</p> <p>Monitor changes in aquatic vegetation to determine changes in species composition, with particular reference to Canadian pondweed (<i>Elodea canadensis</i>).</p> <p>Monitor the reserve for new invasions of exotic flora.</p> <p>Educate anglers and other users of the wetland and Lake Crescent about the importance of cleaning equipment to prevent the spread of aquatic weeds between waterbodies.</p> <p>Maintain appropriate water regimes as per Section 5.2 to reduce intrusion by introduced terrestrial species.</p> <p>Seek volunteer assistance for planned and programmed works in control and eradication of weeds.</p> <p>An integrated approach involving adjacent landholders and managers, to eradicate or control gorse (<i>U. europaeus</i>) should be sought.</p>
5.6	<p>Phytophthora Protection</p> <p>Inform visitors of the <i>Phytophthora</i> threat to the reserve.</p> <p>Periodically survey the reserve for outbreaks of the disease.</p>
5.7	<p>Housings sub-division and shacks</p> <p>Ensure septic tanks and public toilets are maintained properly to ensure adjacent waterbodies are not polluted.</p> <p>Liase with the Central Highlands Council to ensure no new sub-divisions are established in close proximity to the wetland.</p> <p>All shacks within the Interlaken Lakeside Reserve to be managed in accordance with conclusions of the shack categorisation process under the <i>Crown Land (Shack Sites) Act 1997</i>.</p>
5.8	<p>Grazing extraction</p> <p>Review the usage of the gravel pit and determine feasibility of closing and rehabilitating the area.</p>

Section	Key Recommendations from the Plan
5.9	<p><i>Development works</i></p> <p>All development should take in to consideration the recommendations and actions from this management plan.</p> <p>Use the best available and practicable technology to protect the environment from human impacts.</p> <p>Assess all proposals for minor works, research, or maintenance involving ground breaking, disturbance or environmental manipulation of any kind in accordance with procedures approved by the Director of National Parks and Wildlife.</p>
5.10	<p><i>Reserve boundaries</i></p> <p>If the opportunity arises, purchase and include the private property adjacent to the eastern edge Interlaken Lakeside Reserve into the reserve.</p> <p>Consider including nearby Crown Land allotments into the proposal to reserve the area as a Conservation Area (see Section 5.1).</p>
6.1	<p><i>Vehicle use and access</i></p> <p>All off-road vehicle driving continues to be prohibited within the reserve.</p> <p>Vehicles are restricted to existing roads/tracks only.</p> <p>Before proceeding with any re-routing of existing tracks, the proposed route should be assessed for disease risk, habitat impacts and both species and cultural significance.</p> <p>Review responsibilities for road maintenance.</p>
6.2.1	<p><i>Recreation</i></p> <p>Fishing to be permitted within the reserve in accordance with IFS regulations.</p> <p>All fish stocking within the reserve is to be carried out by the IFS in accordance with future stocking policies.</p> <p>The only recreational fish species that may be used to stock the reserve are salmoniids.</p> <p>Minimal impact wading, restricted to the wetland edges only, should be encouraged to avoid damaging vegetation and disturbing wildlife.</p> <p>Assess the long term impacts of wading on aquatic vegetation.</p> <p>Inform anglers of the importance of cleaning equipment, including waders, to avoid transferring pest plants and fish eggs.</p> <p>Liaise with the IFS on the dissemination of information to anglers.</p> <p>Assess the impact of the commercial eel fishery on the wetland.</p>

Section	Key Recommendations from the Plan
6.2.2	<p>Recommend duck shooting to be prohibited within the Interlaken Lakeside Reserve.</p> <p>If duck shooting is prohibited, existing duck hides should be removed from the reserve.</p> <p>Inform and educate shooters of the new restrictions with regard to duck hunting.</p> <p>The prohibition of wallaby and deer hunting within the reserve should remain.</p>
6.2.3	<p>The use of boats on the wetland should be restricted to unpowered vessels.</p> <p>Inform boat users of potential impacts of using motorised boats within the wetland through signage at the boat launching ramp.</p> <p>Inform visitors of the restrictions of the use of motorised boats in the reserve.</p>
6.2.5	<p>Campers should be confined to the designated camp areas. No camping on the island is permitted.</p> <p>Recommend the establishment of permanent camp fire places.</p> <p>Encourage campers to bring in their own wood.</p> <p>Encourage minimal impact camping and use of the reserve.</p> <p>Assessment of numbers of campers in the reserve should be undertaken regularly to determine the adequacy of the facilities.</p> <p>Dogs are permitted within the reserve subject to the following minimum conditions:</p> <ul style="list-style-type: none"> - Dogs must be on a lead and kept under close control at all times and - Owners must ensure there is no disturbance to wildlife and other visitors. <p>No other pets are to be brought into the reserve.</p>
6.5	<p>Encourage only those tourism ventures that focus on the natural and cultural values of the conservation area.</p> <p>Provide assistance and information to operators of tourism ventures so that disturbance to wildlife is minimised and visitor experience is maximised.</p> <p>Prohibit permanent tourist developments within the reserve and ensure future developments adjacent to the reserve are sympathetic with the natural environment.</p>

Section	Key Recommendations from the Plan
7	<p><i>Interpretation and education</i></p> <p>Erect an interpretive sign along the Interlaken Road at the Lake Crescent boat ramp to provide information on:</p> <ul style="list-style-type: none"> – the Ramsar Convention; – criteria for listing the Interlaken Lakeside Reserve as a Ramsar site; – conservation and environmental values of the reserve with particular reference to threatened flora and fauna and waterbirds; – appropriate recreational activities; – any relevant instructions. <p>Inform visitors of appropriate minimal impact use of the reserve.</p> <p>Prepare and implement an interpretation plan to guide development of interpretation facilities.</p> <p>Educate and encourage visitors to adopt safe practices and provide them with sufficient information about potential hazards to enable them to make responsible decisions.</p> <p>Liaise with teachers and organisations such as Waterwatch and Landcare to encourage educational programs in the reserve.</p> <p>Seek a special relationship with the local school in developing educational programs and activities based on the particular values of the reserve.</p> <p>Consider the reserve in the context of all parks and reserves within the Central Highlands and their particular values, in developing an interpretation and education strategy.</p>
8.1	<p><i>Community groups</i></p> <p>Encourage future involvement from angler groups in conservation activities.</p> <p>Develop good working relations with adjacent land managers, the local community and the Aboriginal community in matters of mutual interest.</p> <p>Liaise with the Central Highlands Council to ensure consistency, as far as possible between this plan, site plans and the municipal planning scheme.</p>

Section	Key Recommendations from the Plan
8.2	<p><i>Working with adjacent landholders</i></p> <p>Regularly liaise and develop good working relations with adjacent land owners and land managers on management issues and projects of common interest.</p> <p>Develop land management practices which require off-reserve or cross-tenure implementation to protect natural values with neighbours.</p>
9	<p><i>Research and monitoring</i></p> <p>Encourage relevant research as outlined:</p> <ul style="list-style-type: none"> - Species composition and abundance of aquatic vegetation at high water levels; - Effect of the wetland on nutrient inputs from surrounding land; - Baseline water quality data within the wetland; - Effect of recreation activities such as fishing on aquatic vegetation; - The use of the wetland by golden galaxias (<i>Galaxias auratus</i>); - Species abundance and community composition of macroinvertebrates within the wetland; - A survey of terrestrial flora and fauna; - A comprehensive archaeological assessment; - An assessment of visitation within the reserve. <p>Written approval and appropriate permits granted from DPIWE of all manipulative research proposed within the reserve is required before research begins.</p> <p>Only research that does not have long term adverse effects on the natural, cultural or aesthetic values of the reserve should be permitted.</p> <p>The approval of the Tasmanian Aboriginal community is to be obtained for any research which may impact Aboriginal heritage values.</p>

Section	Key Recommendations from the Plan
10	<p data-bbox="403 331 858 367"><i>Review and evaluation of the plan</i></p> <p data-bbox="403 383 1358 495">Review the plan 10 years after gazettal of the Governor’s approval, or earlier if research, environmental monitoring or other circumstances show this to be necessary.</p> <p data-bbox="403 510 1358 622">In the review of the plan, evaluate the implementation of the management recommendations and their effectiveness in achieving the vision and management objectives of the plan.</p> <p data-bbox="403 638 1358 712">As a minimum, use the performance indicators set out in Appendix 6 when evaluating the plan’s implementation and outcomes.</p> <p data-bbox="403 728 1358 840">Utilise any relevant, additional monitoring and evaluation procedures developed during the period of the plan when evaluating the plan implementation and outcomes.</p>

The recommendations of this management plan will be subject to funding and other resources sufficient to meet them and may be prioritised according to resource availability.

12. References

- Andrew, J. (2002). *Derwent Catchment Natural Resource Management Plan*. Derwent Catchment NRM Steering Committee, Hamilton, Tasmania.
- ASFB. (1999). Conservation Status of Australian Fishes - 1999. *Australian Society for Fish Newsletter* 29: 34-37.
- Blackhall S. A. (1986). *A survey to determine waterbird usage and conservation significance of selected Tasmanian wetlands*. Occasional Paper Number 14. National Parks and Wildlife Service, Tasmania.
- BOM. (2002). *Climate Information*. www.bom.gov.au/climate. Bureau of Meteorology, Australia.
- Brock, M. A. & Casanova, M. T (2000). *Are there plants in your wetland? Revegetating wetlands*. LWRDC, UNE, DLWC and EA.
- Cheng D. M. H. & Tyler P. A. (1973). Lakes Sorell and Crescent - A Tasmanian Paradox. *Internationale Revue Der Gesamten Hydrobiologie*. 58: 307-343.
- Chilcott S. J. (1986). *Lake Crescent Environmental Impact Statement. The effects of a 0.5 m water level increase of Lake Crescent*. Inland Fisheries Commission. Commissioned by the Rivers and Water Supply Commission and the Clyde Water Trust, Hobart.
- Cleary, C. (1997). Habitat preferences of the endemic hydrobiid gastropod, "*Austropyrgus*" sp., and other aquatic gastropods from Lakes Sorell and Crescent, Central Plateau, Tasmania. Honours Thesis. University of Tasmania, Hobart.
- Cutler L. J., Kinrade, P. A., Sawyer, N. A., Stephenson, N. H. and Croome, R. L. (1990). *Lakes Sorell and Crescent – their irrigation history, hydrology and ecology with particular reference to the proposal to raise the level of Lake Crescent*. University of Tasmania, Hobart, Tasmania.
- DNRE. (1996). *Manual of Wetlands Management*. Department of Natural Resources and Environment, Melbourne.
- DPIWE. (1998). *Draft Threatened Species Strategy*. Department of Primary Industries, Water and Environment, Hobart.
- DPIWE. (2000). *A Wetlands Strategy for Tasmania. Draft Discussion Paper*. Department of Primary Industries, Water and Environment, Hobart.
- DPIWE. (2001a). *Proposed Environmental Management Goals for Tasmanian Waters. Derwent River Catchment, Public Discussion Paper*. Department of Primary Industries, Water and Environment, Hobart.
- DPIWE. (2001b). *Tasmania's Nature Conservation Strategy: draft for public comment*. Department of Primary Industries and Environment, Hobart.
- Dredge D. D. (1981). *Ecology and feeding behaviour of the Tasmanian tiger snake, *Notechis ater* Humphreysi*. B.Sc (Hons). Thesis. University of Tasmania, Hobart. pp 171.
- EA. (1997). *The Wetlands Policy of the Commonwealth of Australia*. Environment Australia, Canberra.

- EA. (2001). *A Directory of Important Wetlands in Australia*. Environment Australia, Canberra.
- EA. (2002). *Environment Protection and Biodiversity Act*. Environment Australia, Canberra.
- Frijlink S. (2000). *Lakes Sorell and Crescent rehabilitation Project. Background Information Paper*. Inland Fisheries Service, Hobart.
- Fulton W. (1983). Macrobenthic fauna of Great Lake, Arthurs Lake and Lake Sorell. *Australian Journal of Marine and Freshwater Research*. 34: 755-785.
- Hardie S. A. (2003a). *An Assessment of the Status of Macroinvertebrate Communities in Lakes Crescent and Sorell, Tasmania*. Inland Fisheries Service, Hobart.
- Hardie S. A. (2003b). *Current Status and Ecology of Golden Galaxias (*Galaxias auratus*)*. Inland Fisheries Service, Hobart.
- Heffer D. K. (2003). *Wetlands of Lakes Sorell and Crescent: Conservation and Management*. Inland Fisheries Service, Hobart.
- Kirkpatrick J. B. & Harwood C. E. (1981). *The conservation of Tasmanian wetland macrophytic vegetation and communities*. Tasmanian Conservation Trust Inc., Hobart.
- Kirkpatrick J. B & Tyler P. A. (1988). Tasmanian Wetlands and their Conservation. In '*Conservation of Australian Wetlands*'. (Eds. A. J. Mc Comb & P. S. Lake). Surrey beatty & Sons Pty. Ltd., NSW. pp 1-16.
- Leonard B. V. T., B. V. (1974). The littoral rock fauna of three highland lakes in Tasmania. *Paper and Proceedings of the Royal Society of Tasmania*. 108: 151-156.
- McDowall R. (1996). *Freshwater Fishes of South-eastern Australia*. Reed Books, Sydney.
- Plomley N. J. B. (1966). *Friendly Mission. The Tasmanian journals of George Augustus Robinson 1829-34*. Tasmanian Historical Research Association, Hobart.
- Plomley N. J. B. (1992). *The Aboriginal/Settle clash in Van Diemen's Land 1803-1823*. Queen Victoria Museum and Art Gallery, Hobart.
- PWS. (2002a). *Conservation Areas Listing*.
<http://www.dpiwe.tas.gov.au/inter.nsf/WebPages/SJON-53L2AE>. Parks and Wildlife Service, Tasmania.
- PWS. (2002b). *Gorse (*Ulex europaeus* L.)*.
<http://www.dpiwe.tas.gov.au/inter.nsf/WebPages/RPIO-4ZW4ET?open>. Parks and Wildlife Service, Tasmania.
- Ramsar. (2002). *The Ramsar Convention on Wetlands*. <http://www.ramsar.org>. Ramsar Convention Bureau.
- Robertson A. I. (1997). Land-water linkages in floodplain river systems: the influences of domestic stock. In: '*Frontiers in Ecology: Building the Links*' (Ed. N. L. Klomp, I.). pp. 207-217. Elsevier Science, Oxford.
- Smith O. L., Goede, A. & Blackhall, S. A. (1995). Lead Contamination of Waterfowl in Tasmania by Ingestion of Shotgun Pellets from Duck Shooting. *Wildlife Research*. 22: 611-623.

- TDOM. (1986). *Interlaken*. Geological Atlas 1:50000 Series. Tasmanian Department of Mines, Hobart.
- Thomas and Associates. (1986). An archaeological survey of Lake Crescent. Commissioned by the Inland Fisheries Commission, Hobart.
- Timms B. V. (1978). The benthos of seven lakes in Tasmania. *Archival Hydrobiology*. 81: 422-444.
- TSU. (in press). *Listing Statement Golden Galaxias (Galaxias auratus)*. Threatened Species Unit, Parks and Wildlife Service, Tasmania.
- Uytendaal A. (2003). *Water Quality in Lakes Sorell and Crescent: Underlying Processes and Management Options*. Inland Fisheries Service, Hobart.

Glossary

Biodiversity (biological diversity)	The variety of life forms; the different plants, animals and microorganisms, the genes they contain and the ecosystems they form. It is usually considered at four levels: genetic diversity, species diversity, community diversity and ecosystem diversity.
Conservation	All the processes and actions of looking after a place so as to retain its significance, always including protection, maintenance and monitoring.
Indigenous species	A species that occurs at a place within its historically known natural range and that forms part of the natural biodiversity of a place.
Introduced species	A translocated species of alien species occurring at a place outside its historically known natural range as a result of intentional or accidental dispersal by human activities.
Protection	Taking care of a place by maintenance and by managing impacts to ensure that significance is retained.
Threatened species	A species listed in the Schedules of the Tasmanian <i>Threatened Species Protection Act 1995</i> .

Appendices

Appendix 1. Interlaken Lakeside Reserve – Ramsar Listing

1. **Name** Interlaken Lakeside Reserve, Tasmania
2. **Date this sheet was completed** 2000
3. **Name of Wetland** Interlaken Lakeside Reserve (Lake Crescent), Tasmania
4. **Geographic coordinates** 42 09'00" South, 147 10'00" East
5. **Altitude** 800 m ASL
6. **Area** 519 ha

7. **Overview**

The Interlaken Lakeside Reserve is a Crown land reserve which covers the northwestern corner of Lake Crescent. It includes the marshy areas at the lake's perimeter, as well as Lakeside Island and a large section of the dry land between Lake Crescent and Lake Sorell, west of Interlaken. The site excludes the private block within it. Access to Lake Crescent is possible by two-wheel drive.

8. **Wetland Type**

O: Permanent freshwater lakes (>8ha); includes large oxbow lakes

R: Seasonal/intermittent saline/brackish/alkaline lakes and flats

9. **Ramsar Criteria**

2a, 2b (Refer to Appendix 2)

11. **Name and address of compiler of this form**

Stewart Blackhall, Anne McEntee and Elizabeth Rollins

Department of Primary Industries, Water and Environment

134 Macquarie Street

Hobart 7000

12. **Justification of the criteria selected under point 9**

Lake Crescent is a valuable representative of this type of wetland at the regional level. It is also an essential element of the maintenance of ecological diversity in the area. When full, the wetland is important for waterbirds as a feeding, resting and breeding area, and as a drought refuge. It supports several species which are rare and/or poorly reserved. The interesting nature of the phytoplankton community and its differences from nearby Lake Sorell are of scientific value.

13. **General location**

Interlaken Lakeside Reserve lies at the north west corner of Lake Crescent, approximately 20 km west of the Tunbridge township.

14. Physical features

The area is underlain by Jurassic dolerite, Tertiary basalt and Triassic sandstone with alluvial deposits common on flats and swampy ground.

15. Hydrological features

Lake Crescent is permanent, with a maximum depth of 2.3 m, a pH of 7 and conductivity of 500 EC. Water from the lake is used for irrigation in the Clyde River valley. Average annual rainfall is 726 mm.

16. Ecological features

A *Triglochin procerum* – *Baumea arthrophylla* marsh community is present at this site. It is an important habitat for black swans (*Cygnus atratus*) and up to five species of ducks. European Carp (*Cyprinus carpio*) have recently been discovered, raising concerns for the future of the lakes. The marshes were de-watered in 1999 due to drought. There is a limnological/scientific paradox between Lake Crescent; as yet unexplained. The two lakes are closely adjacent and have similar morphometry, catchments, climate, geology, soils, vegetation and physio-chemical limnology. However, the phytoplanton populations differ in species composition, population structure, population stability and total biomass. Lake Crescent has a standing crop ten times that of Lake Sorell.

17. Noteworthy flora

The Interlaken Lakeside Reserve is one of the three known localities of *Isolepis montivaga* (mountain isolepis) in Tasmania. This species and *Amphibromus neesii* (swamp wallaby-grass – Rare; Sr; *Threatened Species Protection Act* (TPSA) 1995) are both considered rare. The former is unreserved. The latter is known from only six localities, only one of which is reserved.

18. Noteworthy fauna

When full, the area is locally important for black swan (*Cygnus atratus*) and up to five species of ducks, as a feeding, resting and breeding area. Some of the other bird species observed are white-faced heron (*Egretta novaehollandiae*), black duck (*Anas superciliosa*), native hen (*Gallinula mortierii*), little pied cormorant (*Plalacrocorax melanoleucos*), masked lapwing (*Vanellus miles*) and purple swamphen (*Porphyrio porphyrio*) (Blackhall, pers. comm.). The lake is also home to a population of golden galaxias (*Galaxias auratus*, Rare; Sr, TSPA 1995).

19. Social and cultural values

The area is highly regarded as a hunting and fishing area. It is particularly valued by anglers for the large trout that have been caught here.

20. Land tenure/ownership

On site: Crown Land Recreation Area (Interlaken Lakeside Reserve).

Surrounding area: Private freehold.

21. Current land use

On site: Recreational shooting, fishing and boating, and low intensity grazing.
Surrounding area: Residential, grazing.

22a. Factors (past and present or potential) adversely affecting the sites ecological characters, including changes in land use and development projects

The lake's perimeter is slightly disturbed by grazing in places. Lake Crescent and the neighbouring Lake Sorell contain the only populations of European Carp (*Cyprinus carpio*) in Tasmania. The area formerly had a very low human population but a sub-division of approximately seventy lots has recently been developed along the adjacent shoreline. The recent housing subdivision on adjacent land may cause pollution of the lake through septic tank run-off. The introduction of European Carp (*Cyprinus carpio*) has potential to affect the ecology of the site as they are known to displace other fish and invertebrate species by increasing turbidity of the lake bottom during feeding.

23-24. Conservation measures taken and measures proposed

Conservation Measures: The area was proclaimed a Crown Land Reserve in 1981. It is also listed on the Convention on Wetlands. Management of this site is focusing on the manipulation of water levels in Lake Crescent and the adjoining Lake Sorell, to eradicate carp from this waterway and prevent more widespread infestation of the State's waterways. Ongoing advice on the conservation values and management needs of the site is being provided to the carp eradication project. A project administered by the Inland Fisheries Service is investigating the effect of drought on the ecological character of the site.

Conservation Measures Proposed: It is proposed that waterfowl hunting inside the reserve ceases. A possible extension of the Ramsar site boundary is proposed to include the whole lake if further populations of *Isolepis montivaga* are found.

25. Current scientific research and facilities

The waterbird population is counted annually and considerable research is aimed at controlling the carp population. A well equipped hut provided by the Department of Primary Industries, Water and Environment on the shore of Lake Sorell is frequently used for research and management purposes. The Inland Fisheries Service has also purchased a house in the area for use during the carp control program.

26. Current conservation education

None known.

27. Current recreation and tourism

The area is being used increasingly by sport anglers because of improving access and availability of recreational vehicles. Estimated visitor numbers increased from 950 in 85/86 to a maximum of 3,600 in 91/92. The area has been closed to anglers since 1995 due to de-watering of the lake by drought. The lake is not expected to be re-opened for the next 2-3 seasons.

28-29. Jurisdiction and management authority

Territorial: Northern Midlands Municipal Council.

Functional & Management: Director, Parks & Wildlife Service, Tasmania (134 Macquarie Street, Hobart).

30. Biological references

Anon. (1995). The European Carp (*Cyprinus carpio*) in Lake Crescent. Inland Fisheries Service, Hobart.

Cheng, D.M.H. & Tyler, P.A. (1976). Primary productivity and trophic status of Lakes Sorell and Crescent, Tasmania. *Hydrobiologia*. 48(1): 59-64.

Kirkpatrick, J.B. & Harwood, C.E. (1981). *The conservation of Tasmanian wetland macrophytic species and communities*. A Report to the Australian Heritage Commission from the Tasmanian Conservation Trust Inc., Hobart.

Kirkpatrick, J.B. & Harwood, C.E. (1983). The conservation of Tasmanian macrophytic wetland vegetation. *Pap. Proc. R. Soc. Tas.* 117: 5-20.

Kirkpatrick, J.B. & Tyler, P.A. (1988). Tasmanian wetlands and their conservation. In: McComb, A.J. & Lake, P.S. (Eds.), *The conservation of Australian wetlands*, pp 1-16. Surrey Beatty & Sons Pty. Ltd., Sydney.

Sharpe, M. (1995). *Tasmanian wetlands listed under the Ramsar Convention*. Unpublished report; Department of Environment and Land Management, Hobart.

Appendix 2. Criteria for Identifying Wetlands of International Importance

A wetland is identified as being of international importance if it meets at least one of the criteria set out below:

Group A of Criteria. Sites containing representative, rare or unique wetland types

Criteria 1: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

Group B of the criteria. Sites of international importance for conserving biological diversity

CRITERIA BASED ON SPECIES AND ECOLOGICAL COMMUNITIES

Criteria 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

Criteria 3: A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

Criteria 4: A wetland should be considered internationally important if it supports populations of plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

SPECIFIC CRITERIA BASED ON WATER BIRDS

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more water birds.

Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of water bird.

SPECIFIC CRITERIA BASED IN FISH

Criterion 7: A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.

Criterion 8: A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

Appendix 3. Plant species recorded in the wetland section of the Interlaken Lakeside Reserve

- i introduced to Tasmania
 t listed in the schedules of the *Threatened Species Protection Act* 1995;
 v – vulnerable, e – endangered, r - rare

FAMILY	Scientific Name	Common name
Dicotyledonae		
APIACEAE	<i>Hydrocotyle hirta</i>	hairy pennywort
APIACEAE	<i>Hydrocotyle muscosa</i>	mossy pennywort
APIACEAE	<i>Lilaeopsis polyantha</i>	Australian lilaeopsis
ASTERACEAE	<i>Brachyscome angustifolia</i>	
ASTERACEAE	<i>Euchiton collinus</i>	
ASTERACEAE	<i>Leptinella reptans</i>	
i ASTERACEAE	<i>Onopordum acanthium</i>	scotch thistle
ASTERACEAE	<i>Pseudo-gnaphalium luteo-album</i>	
i ASTERACEAE	<i>Senecio vulgaris</i>	groundsel
i ASTERACEAE	<i>Taraxacum officinale</i>	common dandelion
BORAGINACEAE	<i>Myosotis australis</i>	
BRASSICACEAE	<i>Rorippa dictyosperma</i>	
CAMPANULACEAE	<i>Pratia surrepens</i>	pratia
CLUSIACEAE	<i>Hypericum japonicum</i>	matted st. john's wort
CRASSULACEAE	<i>Crassula helmsii</i>	swamp stonecrop
i FABACEAE	<i>Trifolium dubium</i>	yellow suckling
HALORAGACEAE	<i>Myriophyllum simulans</i>	common milfoil
MENYANTHACEAE	<i>Villarsia reniformis</i>	running marsh flower
ONAGRACEAE	<i>Epilobium tasmanicum</i>	
PORTULACEAE	<i>Montia fontana</i>	
PORTULACEAE	<i>Neopaxia australasica</i>	white purslane
RANUNCULACEAE	<i>Ranunculus amphitrichus</i>	small river buttercup
ROSACEAE	<i>Acaena novae-zeldiae</i>	buzzy
RUBIACEAE	<i>Galium gaudichaudii</i>	
SCROPHULARIACEAE	<i>Limosella australis</i>	mudwort
VIOLACEAE	<i>Viola hederacea</i>	ivy-leaf violet

FAMILY	Scientific Name	Common name
Monocotyledonae		
CYPERACEAE	<i>Baumea arthropylla</i>	soft twig-rush
CYPERACEAE	<i>Carex gaudichaudiana</i>	
CYPERACEAE	<i>Chorizandra australis</i>	bristle-rush
CYPERACEAE	<i>Eleocharis acuta</i>	common spike-rush
CYPERACEAE	<i>Eleocharis sphacalata</i>	tall spike-rush
CYPERACEAE	<i>Isolepis fluitans</i>	floating clubrush
CYPERACEAE	<i>Isolepis montivaga</i>	mountain isolepis
CYPERACEAE	<i>Schoenus tesquorum</i>	soft bogrush
JUNCACEAE	<i>Juncus bufonius</i>	toad rush
JUNCACEAE	<i>Juncus holoschoenus</i>	joint-leaf rush
JUNCACEAE	<i>Juncus</i> spp.	
JUNCAGINACEAE	<i>Triglochin procerum</i>	water ribbons
POACEAE	<i>Agrostis aemula</i>	
POACEAE	<i>Agrostis avenacea</i>	common blown-grass
i POACEAE	<i>Agrostis stolonifera</i>	creeping bent
POACEAE	<i>Amphibromus recurvatus</i>	swamp wallaby-grass
POACEAE	<i>Amphibromus sinuatus</i>	
t(r) POACEAE	<i>Amphibromus neesii</i>	
i POACEAE	<i>Anthoxanthum odoratum</i>	sweet vernal grass
i POACEAE	<i>Festuca</i> sp.	
i POACEAE	<i>Holcus lanatus</i>	yorkshire fog
i POACEAE	<i>Poa bulbosa</i>	
POACEAE	<i>Poa labillardieri</i>	
i POACEAE	<i>Vulpia bromoides</i>	squirrel-tail fescue
i POACEAE	<i>Vulpia myuros</i>	rat's-tail fescue
POTAMOGETONACEAE	<i>Potamogeton tricarinatus</i>	floating pondweed

Appendix 4. Fauna Species List of the Lake Crescent area

i introduced to Tasmania

t listed in the schedules of the *Threatened Species Protection Act 1995*;

v – vulnerable, e – endangered, r - rare

m migratory species;

J – listed on the Japan-Australia Migratory Bird Agreement (JAMBA)

C – listed on the China-Australia Migratory Bird Agreement (CAMBA)

Sightings (B. Mawbey & R. Mawbey, pers. comm.): Past sightings indicate observations previously made over the past thirty year; Recent sightings indicate observations made since 2000.

Code	Common Name	Scientific Name	Sightings
BIRDS			
ORDER ANSERIFORMES			
	black swan	<i>Cygnus atratus</i>	Recent wetlands/lakes
	Australian shelduck	<i>Cereopsis novaehollandiae</i>	Recent wetlands/lakes
	pacific black duck	<i>Anas superciliosa</i>	Recent wetlands/lakes
	grey teal	<i>Anas gracilis</i>	Recent wetlands/lakes
	chestnut teal	<i>Anas castanea</i>	Recent wetlands/lakes
	little pied cormorant	<i>Phalacrocorax melanoleucos</i>	Recent lakes
	great cormorant	<i>Phalacrocorax carbo</i>	Recent lakes
	Australian wood duck	<i>Chenonetta jubata</i>	Recent wetland/lakes
t (r)	great crested grebe	<i>Podiceps cristatus</i>	Past wetlands/lakes
	hoary-headed grebe	<i>Poliiocephalus poliocephalus</i>	Recent lakes
	musk duck	<i>Biziura lobata</i>	Recent Kemps Marsh
ORDER CICONIIFORMES			
	white-faced heron	<i>Egretta novaehollandiae</i>	Recent wetlands
m (C)	great egret	<i>Ardea alba</i>	Past wetlands
m (J/C)	cattle egret	<i>Ardea ibis</i>	Past wetlands
	Australasian bittern	<i>Botaurus poicilopyilus</i>	Past wetlands
	purple swampphen	<i>Porphyrio porphyrio</i>	Recent wetlands
	Tasmanian native hen	<i>Gallinula mortierii</i>	Recent wetlands
m	Eurasian coot	<i>Fulica atra</i>	Past wetlands/lakes
m (J/C)	Latham's snipe	<i>Gallinago hardwickii</i>	Recent wetlands

Code	Common Name	Scientific Name	Sightings
ORDER FALCONIFORMES			
t (e)	wedge-tailed eagle	<i>Aquila audax fleayi</i>	Recent wetlands/lakes
m (C)	white-bellied sea eagle	<i>Haliaeetus leucogaster</i>	Recent wetlands/lakes
	marsh/swamp harrier	<i>Circus approximans</i>	Recent wetlands
	brown goshawk	<i>Accipiter fasciatus</i>	Recent terrestrial
t (e)	grey goshawk	<i>Accipiter novaehollandiae</i>	Past terrestrial
	collared sparrowhawk	<i>Accipiter cirrhocephalus</i>	Recent terrestrial
	brown falcon	<i>Falco berigora</i>	Recent terrestrial
	peregrine falcon	<i>Falco peregrinus</i>	Recent terrestrial
ORDER CHARADRIIFORMES			
	masked lapwing	<i>Vanellus miles</i>	Recent wetlands
	red-capped plover	<i>Charadrius ruficapillus</i>	Recent wetlands
	banded lapwing	<i>Vanellus tricolor</i>	Recent wetlands
	masked lapwing	<i>Vanellus miles</i>	Recent wetlands
	silver gull	<i>Larus novaehollandiae</i>	Recent wetlands/lakes
m (C)	caspiian tern	<i>Sterna caspia</i>	Recent Lake Sorell one sighting
ORDER PSITTACFORMES			
	common bronzewing	<i>Phaps chalcoptera</i>	Recent terrestrial
	yellow-tailed black-cockatoo	<i>Calyptorhynchus funereus</i>	Recent terrestrial
	musk lorikeet	<i>Glossopsitta concinna</i>	Past terrestrial
	eastern rosella	<i>Platycercus eximius</i>	Recent terrestrial
m	swift parrot	<i>Lathamus discolor</i>	Past terrestrial
m	blue-winged parrot	<i>Neophema chrysostoma</i>	Recent terrestrial
	green rosella	<i>Platycercus caledonicus</i>	Recent terrestrial
	sulphur-crested cockatoo	<i>Cacatua galerita</i>	Past terrestrial
m	pallid cuckoo	<i>Cuculus pallidus</i>	Recent terrestrial
m	Horsfield's bronze-cuckoo	<i>Chrysococcyx basalis</i>	Past terrestrial
m	fan-tailed cuckoo	<i>Cacomantis flabelliformis</i>	Recent terrestrial
	shining bronze-cuckoo	<i>Chrysococcyx lucidus</i>	Recent terrestrial
	southern boobook	<i>Ninox novaeseelandiae</i>	Recent terrestrial
	masked owl	<i>Tyto novaehollandiae</i>	Past terrestrial
	tawny frogmouth	<i>Podargus strigoides</i>	Recent terrestrial
	Australian owlet-nightjar	<i>Aegtheles cristatus</i>	Past terrestrial
m	white-throated needletail	<i>Hirundapus caudacutus</i>	Past terrestrial

Code	Common Name	Scientific Name	Sightings
ORDER CORACIIFORMES			
i	laughing kookaburra	<i>Dacelo novaeguineae</i>	Recent terrestrial
ORDER PASSERIFORMES			
m	flame robin	<i>Petroica phoenica</i>	Recent terrestrial
	superb fairy-wren	<i>Malurus cyaneus</i>	Recent terrestrial
	spotted pardalote	<i>Pardalotus punctatus</i>	Recent terrestrial
m	striated pardalote	<i>Pardalotus striatus</i>	Recent terrestrial
	Tasmanian scrubwren	<i>Sericornis humilis</i>	Recent terrestrial
	scrubtit	<i>Acanthornis magnus</i>	Recent terrestrial
	brown thornbill	<i>Acanthiza pusilla</i>	Recent terrestrial
	Tasmanian thornbill	<i>Acanthiza ewingii</i>	Recent terrestrial
	yellow-rumped thornbill	<i>Acanthiza chrysorrhoa</i>	Past terrestrial
	yellow wattlebird	<i>Anthochaera paradoxa</i>	Recent terrestrial
	little wattlebird	<i>Anthochaera chrysoptera</i>	Recent terrestrial
	noisy miner	<i>Manorina melanocephala</i>	Recent terrestrial
	yellow-throated honeyeater	<i>Lichenostomus flavicollis</i>	Recent terrestrial
	strong-billed honeyeater	<i>Melithreptus validirostris</i>	Recent terrestrial
	black-headed honeyeater	<i>Melithreptus affinis</i>	Recent terrestrial
	crescent honeyeater	<i>Phylidonyris pyrrhoptera</i>	Recent terrestrial
	newholland honeyeater	<i>Phylidonyris novaehollandiae</i>	Recent terrestrial
	eastern spinebill	<i>Acanthorhynchus tenuirostris</i>	Recent terrestrial
	white-fronted chat	<i>Epthiamura albifrons</i>	Recent terrestrial
	scarlet robin	<i>Petroica multicolor</i>	Recent terrestrial
	pink robin	<i>Petroica rodinogaster</i>	Past terrestrial
	dusky robin	<i>Melanodryas vittata</i>	Past terrestrial
	spotted quail-thrush	<i>Cinlosoma punctatum</i>	Past terrestrial
ORDER PASSERIFORMES			
	black currawong	<i>Strepera fuliginosa</i>	Recent terrestrial
	grey currawong	<i>Strepera versicolor</i>	Recent terrestrial
	forest raven	<i>Corvus tasmanicus</i>	Recent terrestrial
	Australian magpie	<i>Gymnorhina tibicen</i>	Recent terrestrial
	richards pipit	<i>Anthus novaeseelandiae</i>	Recent terrestrial
	skylark	<i>Alauda arvensis</i>	Recent terrestrial
	olive whistler	<i>Pachycephala olivacea</i>	Past terrestrial
	golden whistler	<i>Pachycephala pectoralis</i>	Recent terrestrial
m	satin flycatcher	<i>Myiagra cyanoleuca</i>	Recent terrestrial
m	black-faced cuckoo-shrike	<i>Coracina novaehollandiae</i>	Recent terrestrial
m	dusky woodswallow	<i>Artamus cyanopterus</i>	Recent terrestrial

Code	Common Name	Scientific Name	Sightings
i	common starling	<i>Sturnus vulgaris</i>	Recent terrestrial
	bassian thrush	<i>Zoothera lunulata</i>	Past terrestrial
m	silveryeye	<i>Zosterops lateralis</i>	Recent terrestrial
	little grassbird	<i>Megalurus gramineus</i>	Recent terrestrial
m	tree martin	<i>Hirundo nigricans</i>	Recent terrestrial
m	welcome swallow	<i>Hirundo neoxena</i>	Recent terrestrial
i	European goldfinch	<i>Carduelis carduelis</i>	Recent terrestrial
i	European greenfinch	<i>Carduelis chloris</i>	Recent terrestrial
	beautiful firetail	<i>Stagonopleura bella</i>	Past terrestrial
m	grey fantail	<i>Rhipidura fuliginosa</i>	Recent terrestrial
	grey butcherbird	<i>Cracticus torquatus</i>	Recent terrestrial
	grey shrike-thrush	<i>Colluricincla harmonica</i>	Recent terrestrial
MAMMALS			
	platypus	<i>Ornithorhynchus anatinus</i>	Recent aquatic
	short-beaked echidna	<i>Tachglossus aculeatus</i>	Recent terrestrial
	common wombat	<i>Vombatus urinus</i>	Recent terrestrial/wetland
	Bennett's (red-necked) wallaby	<i>Macropus rufogriseus</i>	Recent terrestrial/wetland
	Tasmanian pademelon	<i>Thylogale billardierii</i>	Recent terrestrial/wetland
	long-nosed potoroo	<i>Potorous tridactylus</i>	Recent terrestrial
	Tasmanian bettong	<i>Bettongia gaimadi</i>	Recent terrestrial
	spotted-tail quoll	<i>Dasyurus maculatus</i>	Recent terrestrial
	eastern quoll	<i>Dasyurus viverrinus</i>	Recent terrestrial
	Tasmanian devil	<i>Sarcophilus harissi</i>	Recent terrestrial
	southern brown bandicoot	<i>Isodon obesulus</i>	Recent terrestrial
	eastern barred bandicoot	<i>Perameles gunnii</i>	Recent terrestrial
	common ringtail possum	<i>Pseudocheirus peregrinus</i>	Recent terrestrial
	sugar glider	<i>Petaurus breviceps</i>	Recent terrestrial
	brushtail possum	<i>Trichosurus vulpecula</i>	Recent terrestrial
	little pygmy-possum	<i>Cercartetus lepidus</i>	Recent terrestrial
	Tasmanian long-eared bat	<i>Nyctophilus timoriensis sherrini</i>	Past terrestrial
	Tasmanian long-eared bat	<i>Nyctophilus geoffroyi</i>	Past terrestrial
	goulds wattled bat	<i>Chalinolobus gouldii</i>	Past terrestrial
	eastern falsistrelle	<i>Falsistrellus tasmaniensis</i>	Past terrestrial
	little forest bat	<i>Vespadelus vulturinus</i>	Past terrestrial
	southern forest bat	<i>Vespadelus regulus</i>	Past terrestrial
	large forest bat	<i>Vespadelus darlingtoni</i>	Past terrestrial
	chocolate wattled bat	<i>Chalinolobus morio</i>	Recent terrestrial
	water rat	<i>Hydromys chrysogaster</i>	Recent aquatic

Code	Common Name	Scientific Name	Sightings
	swamp (velvet-furred) rat	<i>Rattus lutreolus</i>	Terrestrial/sedgeland
i	black rat	<i>Rattus rattus</i>	Recent terrestrial
i	house mouse	<i>Mus musculus</i>	Recent terrestrial
i	brown hare	<i>Lepus capensis</i>	Recent terrestrial
i	rabbit	<i>Oryctolagus cuniculus</i>	Recent terrestrial
i	fallow deer	<i>Dama dama</i>	Recent terrestrial
REPTILES			
	tiger snake	<i>Notechis scutatus</i>	Recent wetlands
	copperhead snake	<i>Austrelaps superbis</i>	Recent terrestrial/wetland
	white-lipped whip snake	<i>Drysdalia coronoides</i>	Recent terrestrial
	metallic skink	<i>Niveoscincus metallicus</i>	Terrestrial
	three lined skink	<i>Atroscincus duperreyi</i>	Terrestrial
	spotted skink	<i>Niveoscincus ocellatus</i>	Terrestrial
	she-oak skink	<i>Cyclodomorphis casuarinae</i>	Terrestrial
	blotched blue-tongued lizard	<i>Tiliqua nigrolutea</i>	Terrestrial
	mountain dragon	<i>Rankinia diemensis</i>	Terrestrial
AMPHIBIANS			
	common froglet	<i>Crinia signifera</i>	Recent wetlands
	eastern banjo frog	<i>Limnodynastes dumerilii</i>	Recent wetlands
	spotted marsh frog	<i>Limnodynastes tasmaniensis</i>	Past wetlands
t (v)	green & gold frog	<i>Litoria raniformis</i>	Past wetlands
	brown tree frog	<i>Litoria ewingi</i>	Recent wetlands
	southern smooth froglet	<i>Geocrinia laevis</i>	Past wetlands
	southern toadlet	<i>Pseudophryne semimarmorata</i>	Recent wetlands
FRESHWATER FISH			
	short-finned eel	<i>Anguilla australis</i>	Recent lakes/past wetlands
t (r)	golden galaxias	<i>Galaxias auratus</i>	Recent lakes/past wetlands
i	brown trout	<i>Salmo trutta</i>	Recent lakes/past wetlands
i	European carp	<i>Cyprinus carpio</i>	Recent lakes/past wetlands
i	rainbow trout	<i>Oncorhynchus mykiss</i>	Recent lakes/past wetlands
i	common galaxias	<i>Galaxias maculatus</i>	Recent lakes

NOTE. *Galaxias maculatus* is native to Tasmania but has been introduced into Lake Crescent.

Appendix 5. Macroinvertebrate species recorded in Kemps Marsh (Hardie, 2003b).

L – larvae; A - adult

Class/Order/Family	Species Name
ORDER HYDROZOA	
Hydridae	<i>Hydra</i> sp.
CLASS OLIGOCHAETA	
Oligochaetes	Oligochaete sp.
CLASS HIRUDINEA	
Glossiphoniidae	Leech sp. Unidentified leech
CLASS GASTROPODA	
Planorbidae	<i>Glyptophysa</i> sp.
Planorbidae	<i>Gyraulus</i> sp.
CLASS BIVALVIA	
Sphaeriidae	<i>Pisidium</i> sp.
Sphaeriidae	<i>Sphaerium</i> sp.
ORDER ARACHNIDA-ACARINA (A)	
Pezidae	<i>Peza ops</i>
Oribatidae	Unidentified oribatid Unidentified mite
Eylaidae	<i>Eylais</i> sp. (mite)
Lycosidae	Unidentified lycosids (spider)
CLASS CRUSTACEA (A)	
ORDER CLADOCERA (A)	
Chydoridae	Unidentified chydorids
Daphniidae	<i>Ceriodaphnia quadrangular</i>
Ilyocryptidae	<i>Ilyocryptus</i> sp.
ORDER OSTRACODA	Unidentified ostracod
SUB CLASS COPEPODA	
	Cyclopoid copepod Calanoid copepods Harpacticoid copepods
ORDER AMPHIPODA	
Clenidae	<i>Austrochiltonia australis</i>

Class/Order/Family	Species Name
CLASS INSECTA	
ORDER ODONATA	
Lestidae	<i>Austrolestes analis</i>
ORDER HEMIPTERA	
Notonectidae	<i>Anisops</i> sp.
Corixiidae	<i>Sigara neboissi</i> (A)
Corixiidae	<i>Sigara</i> sp. (L)
Corixiidae	Unidentified corixiid nymph
ORDER COLEOPTERA	
Dytiscidae	<i>Hyderodes shuckhardie</i> (L)
Dytiscidae	<i>Antiporus femoralis</i> (L)
Dytiscidae	<i>Sternopricus</i> sp. (L)
Dytiscidae	<i>Platynectes</i> sp. (L)
Dytiscidae	<i>Megaporus</i> sp. (L)
	<i>Onychohydrus scutellaris</i> (L)
	<i>Chostonectes gigas</i>
Curculionidae	Unidentified weevil sp. (A)
Hydrophillidae	<i>Enochrus</i> sp. (A)
Hydrophillidae	<i>Enochrus</i> sp. (L)
Hydrophillidae	<i>Berosus</i> sp. (L)
Hydrochidae	<i>Hydrochus</i> sp. (A)
Hygrobiiidae	<i>Hygrobia australis</i> (L)
Haliplidae	<i>Haliphus</i> sp. (L)
ORDER DIPTERA	
Chironominidae	
- Tanypodinae	<i>Tanypod</i> spp. (L)
- Chironominae	Chironomid spp. (L)
- Orthoclaadiinae	Orthoclaadiinae spp. (L)
Ceratopogonidae	Unidentified ceratopogonid
ORDER TRICHOPTERA	
Leptoceridae	<i>Notalina</i> sp. (L) Avlo ?
Leptoceridae	<i>Notalina</i> sp. Avlo
	<i>Notoperata sparsa</i>
AMPHIBIA	
Tadpoles	<i>Crinea signifera</i>
Frog	<i>Crinea signifera</i>

Appendix 6. Performance Indicators

Performance indicators provide a guide for measuring progress in implementing the management plan and evaluating how well the management objectives of the plan have been achieved. During the life of this plan, further, more detailed research and monitoring programs, policies or procedures approved by the managing authority may be applied for the evaluation of this plan and its implementation. As a minimum, the following performance indicators will be used when evaluating the plan's implementation and outcomes.

- The natural biological diversity of the indigenous flora and fauna in the reserve is equal to that which occurred at the commencement of the plan.
- Populations of threatened species within the reserve are stable or increasing upon that which occurred at the commencement of the plan.
- The Ramsar values of the reserve are maintained or enhanced. In particular, it maintains populations of threatened flora and fauna species and remains of special value for maintaining biodiversity within the region.
- The significant natural landscapes and catchments in the reserve are intact or restored.
- Optimum water regimes identified within the management plan or within the Lake Crescent water management plan are implemented in accordance with the plans.
- Water quality in the reserve has not deteriorated or has improved.
- An interpretation plan for the reserve has been prepared, implemented and reviewed.
- Research is available which improves the knowledge of the reserve.
- A monitoring plan has been prepared and implemented.
- Research and monitoring results are available which assist effective management decision making on conservation and management of the reserve.
- Introduced flora and fauna, particularly European carp (*Cyprinus carpio*), are controlled or have been eradicated.
- Recreation and tourism in the reserve are characterised by low impact, quiet activities in a natural setting. Low-level mechanised access may occur in specified areas where the impact on natural and cultural values is minimal.
- Recreation and tourism opportunities and facilities identified in the management plan have been developed in accordance with the plan
- Visitor impacts on reserve's values are at sustainable levels for the area in which they occur.
- Visitor and community interest and involvement in, and comment upon, the state of the reserve and its management is regular and predominantly favourable.
- Liaising with neighbours has worked well, in managing adjacent land in a manner sympathetic to values of the reserve.
- Management of the reserve is being monitored and evaluated with reference to these indicators.