Establishing Freshwater Aquatic Reserves in New South Wales

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Executive Summary

1. The NSW State of the Environment Report 2001 states that 'rivers may be the most degraded ecosystems [in NSW], in large part due to the impact of river regulation from dams and weirs'. The *Rivers and Fish in Stress* report (Harris and Gehrke, 1997) documented poor fish diversity and abundance in many NSW river systems and concluded that the decline was ongoing. Almost thirty percent (7 of 25) of all freshwater fish in inland rivers are listed under the *Fisheries Management Act 1994* (FM Act) (as amended in 1997 and 2001) as threatened in New South Wales, and one aquatic ecological community spanning two major river systems has been declared endangered.

2. The NSW Fisheries Scientific Committee identifies the following factors as probable causes of decline for the listed threatened species (FSC, 2001):
   - the introduction of fish outside of their natural range and exotic species;
   - the removal large woody debris;
   - degradation of native riparian vegetation;
   - installation and operation of instream structures (including water extraction) that modify flow regimes and prevent migration and recolonisation;
   - cold water pollution from deep bottom-release dams;
   - habitat changes due to activities such as agriculture (causing siltation, etc) and levees (alienating floodplain habitats);
   - overfishing; and,
   - loss of aquatic vegetation.

   Note that the NSW Scientific Committee, which was established by the *Threatened Species Conservation Act 1995 (TSC Act)* and advises the NSW Minister for the Environment, has also made a preliminary determination to list 'Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands' as a key threatening process under the TSC Act (NSW Scientific Committee, 2001).

3. Whilst creeks and rivers within terrestrial protected areas are afforded a moderate level of protection from habitat degradation, most occur in upland areas. River degradation is generally worse along the western slopes of the Dividing Range and in lowland regulated rivers. In addition, stocking of introduced trout by angling and acclimatisation groups into many highland waterways within National Parks (amazingly often with dollar-for-dollar matching funding by NSW Fisheries) threatens native species in many upland waterways within terrestrial reserves.

4. The *Intergovernmental Agreement on the Environment (1992)* between the Commonwealth and States/ Territories expressly provides for the establishment of a system of freshwater reserves. The *National Strategy for the Protection of Australia's Biological Diversity* and the *NSW Biodiversity Strategy* also commit Governments to the establishment of comprehensive, adequate and representative (CAR) reserves for the protection of biological diversity, including freshwater biodiversity. The National Reserve System (NRS) provides a mechanism for the establishment of a CAR freshwater reserve system. Through the NRS a biogeographic regionalisation approach

has been adopted for terrestrial and marine reserve systems, but none have been developed explicitly for freshwater ecosystems.

5. Despite provisions existing in the FM Act for the creation of aquatic reserves (see Part 7, Division 2), which could be applied equally to freshwater or marine environments, and despite their potential role in protecting freshwater biodiversity and habitat, **none** have been established in freshwater ecosystems since the FM Act was gazetted. Yet eight exist in marine ecosystems, with another 22 proposed for rocky tidal and estuarine ecosystems.

6. There are a number of examples of aquatic reserves in marine and freshwater environments in Australia and overseas which have achieved a measure of protection of aquatic biodiversity and habitat. IRN and ACF believe that the practical difficulties associated with creating FARs in New South Wales can be overcome in much the same way that such difficulties have been overcome in these examples.

Key recommendations

7. **A comprehensive, adequate and representative system of FARs be established across rivers and creeks in New South Wales[*].** Reserve selection should be based upon a biogeographic regionalisation of waterways. As a matter of practicality and an opportunity for rapid action, rivers and creeks which fall within terrestrial reserves already managed for nature conservation should be prioritised for declaration as FARs (in concert with the regionalisation). The two principle agencies responsible for conserving aquatic species and habitats are NSW Fisheries and the New South Wales National Parks & Wildlife Service (NPWS). IRN and ACF are of the opinion that NSW Fisheries is unable to satisfactorily implement its statutory responsibilities under the FM Act, particularly the conservation of aquatic biodiversity and habitat, and recovery of threatened species and ecological communities, without establishing a CAR system of FARs. Similarly, the NPWS lacks sufficient management tools to conserve species and habitats which occur in aquatic environments for which it has a legislative responsibility under the TSC Act and *National Parks and Wildlife Act* (NPW Act) (such as waterbirds, riparian zones, floodplains, freshwater plants, amphibians, reptiles and mammals.) The current level of habitat degradation in the majority of freshwater environments, the impoverished condition of aquatic biota of many rivers and the number of listed threatened aquatic species justifies such a conclusion.

8. Based largely upon the stated purposes of aquatic reserves in the FM Act (cf. section 194), the objectives of FARs could be to
   - protect aquatic habitat and biodiversity in the reserve (FM Act, section 194(2)), or
   - provide for species management in the reserve, such as angling restrictions (FM Act, section 194(2)), or
   - protect threatened species, populations and ecological communities in the reserve (FM Act, section 194(2)), or

[*] A CAR system of freshwater aquatic reserves is not an appropriate approach to conserving rivers in northern Australia and elsewhere where waterways remain in a largely undisturbed state. In such instances, full protection of the entire waterway through protection of the entire catchment or sub-catchment is warranted.

- facilitate educational activities and scientific research (FM Act, section 194(2)), or
- protect river reaches supporting species that are rare or have a limited distribution, or
- raise awareness amongst the general community regarding river health, or
- manage and conserve aquatic ecosystems in pristine condition, particularly streams classified as High Conservation Value, or
- provide for complementary management of reserved freshwater ecosystems in association with terrestrial reserves and Ramsar-listed wetlands.

9. Three categories of aquatic reserves are proposed in accordance with categories of protected areas endorsed by the IUCN – The World Conservation Union. Potential on-ground management actions or conditions attached to use of the river are proposed below for each category. Proposed management provisions are cumulative with increasing levels of protection. Hence actions and management options applying to aquatic protected areas which provide lower levels of protection (e.g. Category VI reserve) also apply to aquatic protected areas which provide higher levels of protection (e.g. Categories IV and II). Section 4.2 provides details and a rationale for each proposed management provision.

   Category II[*]: Protected Area managed mainly for ecosystem conservation and recreation. This category provides the highest level of protection. It should be considered the default option for most FARs.

   GOAL: A natural area designated to:

   (a) protect the ecological integrity of one or more ecosystems for this and future generations, and

   (b) exclude exploitation or occupation inimical to the purpose of designation of the area, and

   (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible

   - Re-introduction of locally extinct species, particularly threatened species
   - Exclusion of angling over some or all of the waterway
   - Exclusion of powerboats over some or all of the waterway
   - Removal or modification of nearby weirs
   - Mitigation of thermal pollution from upstream dams

   Category IV: Protected Area managed mainly for conservation through management intervention. This category provides an intermediate level of protection.

   GOAL: Area subject to active intervention for management purposes so as to ensure the maintenance of habitats and/ or to meet the requirements of specific species.

   - Powerboat management
   - Deliver environmental flows

[*] Waterways in wilderness areas or strict nature reserves may be better protected by a Category I reserve, the goal of which is to manage mainly for science or wilderness protection, environmental monitoring, education, and for the maintenance of genetic resources.

- Control of exotic species
- Improved management of agricultural run-off and irrigation drainage
- Construct fishways

Category VI: Protected Area managed mainly for the sustainable use of natural ecosystems. This category provides the lowest level of protection and may be the most applicable option for highly altered waterways where the goal is to prioritise nature conservation.

GOAL: Area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

- General habitat rehabilitation
- Communication to the local community of fish conservation matters
- Riparian zone protection
- Angling restrictions
- Scientific research and monitoring
- Re-snagging and protection of snags

10. The NSW *Aquatic Biodiversity Strategy* must establish a process for the establishment of a CAR system of FARs, including a timetable for implementation.

11. A Freshwater Aquatic Reserves Working Group needs to be established, jointly staffed by NSW Fisheries and the National Parks & Wildlife Service, to examine and refine options for establishing FARs, including drafting a policy on establishing and managing Freshwater Aquatic Reserves by January 2003. The Working Group would need to develop such a policy with input from other government agencies and public bodies with an involvement in river management, particularly the Department of Land & Water Conservation which administers the NSW *Water Management Act 2000* (WM Act). The WM Act contains several key principles relevant to the establishment and management of FARs, such as protecting and restoring aquatic species and habitats and prioritising the delivery of environmental flows (section 5). The Working Group should conduct community consultation and be advised by a Freshwater Aquatic Reserves Community Reference Panel to be established jointly by the NSW Minister for Fisheries and the NSW Minister for the Environment.

12. The FAR Working Group should determine the level of interest amongst land holders and other members of rural and regional communities to enter into voluntary conservation agreements as a means of establishing FARs over private land.

13. A community consultation process should be undertaken to raise awareness of the need for FARs.

14. The FM Act and NPW Act should be amended as appropriate to enhance the capacity of the NSW Government to establish and manage a system of FARs.

15. Within the proposed biogeographic regionalisation of NSW rivers, and cognisant of the financial, practical and legal constraints pertinent to the declaration of FARs, the following river reaches should be investigated for their suitability:

    - Reaches of the Paroo, Warrego, Barwon and Narran Rivers
    - The River Murray between Echuca and Yarrawonga, in consultation with the Victorian Government
    - Reaches of the upper Murrumbidgee River, in consultation with the ACT Government
    - Reaches of the lower Murrumbidgee River
    - Reaches of the upper Clarence and Richmond Rivers, which support the endangered trout cod
    - Reaches of the upper Gwydir River, which support healthy populations of some native fish species

1. Purpose

This document presents a case for establishing a comprehensive, adequate and representative (CAR) system of Freshwater Aquatic Reserves (FARs) in New South Wales. The State Government agency responsible for administering the *Fisheries Management Act 1994 (NSW)* (amended 1997 and 2001) (FM Act), NSW Fisheries, has established eight aquatic reserves to date in marine/estuarine areas, and is in the process of establishing up to another twenty two. Further, four Marine Parks are either in existence or being planned for joint administration by NSW Fisheries and the NSW National Parks & Wildlife Service (though management plans have not been produced for any).

Yet no aquatic reserves exist in freshwater rivers or creeks, and no process currently exists for their establishment. The draft NSW *Aquatic Biodiversity Strategy* fails to adequately provide for the establishment of a CAR system of FARs in NSW. No timetable exists for their establishment. This is despite provisions in the FM Act that permit the establishment of a system of FARs having existed since the FM Act was amended to enhance habitat protection provisions in 1997.

FARs would provide important protection for aquatic habitats and fish[1], and would also be a useful management tool for assisting the recovery of threatened fish species and ecological communities listed under the FM Act. Following an examination of compelling and convincing evidence regarding declines in freshwater fish populations and degradation of river habitats, the paper examines legislation and policy that support the establishment of FARs. A brief examination of the establishment of freshwater reserves in other countries follows. The paper then examines objectives, selection criteria and levels of protection for FARs, according to the IUCN Protected Area categories. Recommendations are provided for establishing FARs.

[1] 'Fish' is defined broadly in the *Fisheries Management Act 1994* to include '*marine, estuarine or freshwater fish or other aquatic animal life at any stage of their life history (whether alive or dead)'*, see FM Act, s5.

2. Introduction

This issues paper argues for the establishment of a system of freshwater aquatic reserves (FARs) in New South Wales for the conservation of habitat and aquatic biodiversity. FARs would allow government and community to improve management and conservation of aquatic fauna, particularly native fish and invertebrates, and aquatic plants. Although this paper focuses on inland rivers in NSW, aquatic reserves can apply equally to all riverine environments in NSW.

Ample legislation and strategies exist at the State, national and international level which provide a framework for the establishment of FARs. In the FM Act, NSW has arguably the most advanced piece of legislation regarding the conservation of freshwater biodiversity in Australia.

Whilst the FM Act has jurisdiction over fish and other species defined as a fish by the Act (see section 5), the NPW Act has jurisdiction over many other aquatic species, such as waterbirds, riparian zones, floodplains, freshwater plants, amphibians, reptiles and mammals. In addition, some littoral and riparian habitats, which are likely to occur within a FAR, fall under the jurisdiction of the NPW Act. Hence whilst the NPW Act does not provide of the creation of aquatic reserves, it does provide NPWS with jurisdiction over the management of many species and habitats which would occur within a FAR. The vast experience gained by NPWS staff in managing the large number of waterways which fall within terrestrial reserves would be invaluable in guiding the establishment of FARs.

Provisions for aquatic reserves exists within the FM Act (Part 7 Division 2) and may be equally applied to freshwaters as to marine and estuarine areas. Whilst eight marine and estuarine aquatic reserves / interim protected areas exist in NSW and with the establishment of another 22 marine and estuarine aquatic reserves currently being proposed, no freshwater aquatic reserves exist in NSW (NSW Fisheries, 2001). The draft *NSW Aquatic Biodiversity Strategy* fails to provide for the establishment of a CAR system of FARs despite the widely acknowledged stresses facing freshwater ecosystems. Substantial progress in formulating strategies and selection criteria remains to be achieved before on-ground outcomes can be expected.

In addition, no critical habitat has been declared for protecting native freshwater fish. Declaration of critical habitat is hence another potential avenue for protecting native fish, although such areas may only be declared to protect listed endangered species, populations and ecological communities. Further, of four Habitat Protection Plans (HPP) produced, HPP No. 1 is the only HPP that is pertinent to freshwater and it is ineffective for addressing many of the major degrading impacts upon rivers.

The lack of FARs is all the more noteworthy given that terrestrial and marine reserves are seen as the 'jewels in the crown' of biodiversity conservation efforts in their respective environments.

2.1 Reasons for lack of progress in establishing FARs

There appear to be several contributing factors to inaction over the creation of FARs:

1. The heterogeneous nature of land tenure along rivers, with most ownership being private (and some land titles extending to the river's edge or the middle of the channel), and the statutory requirement of landholder consent for an aquatic reserve to be declared. The majority of riparian lands and river beds are privately owned;
2. The nature of rivers and the inability of a FAR to directly prevent or regulate upstream activities which impact adversely upon aquatic biodiversity and habitat within the FAR;
3. Historical unwillingness of NSW Fisheries and the NSW Government to institute changes that may impact on landholders (due to perceived and real reticence of landholders towards a reserve and restrictions on their ability to use a river) and impose further significant restrictions on recreational angling access to rivers;
4. Potential costs of compliance strategies and reserve management strategies;
5. Concern within NSW Fisheries as to the costs of establishing FARs, particularly purchasing private land along river banks if found to be necessary;
6. Reserve site selection is not straightforward, in large part due to the movement of native fish along a river and potentially from inside to outside a FAR. However the same argument can be made in relation to terrestrial and marine reserves;
7. Failure of NSW Fisheries to commit sufficient resources and staff to complete preliminary investigations into FARs; and,
8. High turnover of NSW Fisheries staff in regional areas which has undermined the development of long-term working relationships between fish conservation staff and other river stakeholders requisite in effecting FARs on the ground.

IRN and ACF appreciate that many obstacles exist to establishing a system of FARs. Nevertheless we consider them to be necessary and potentially highly effective tools in conserving aquatic habitat and biodiversity – a key objective of the FM Act (section 3(2); Objectives). Problems of a similar nature as those detailed above have been overcome in establishing terrestrial and marine reserves, Ramsar wetland sites, and in a number of effective international working models for freshwater habitat protection. Further, state, national and international legislation and agreements provide a strong rationale and basis for establishing FARs.

2.2 Declining river health

The ecological imperative for improving the capacity of NSW Fisheries, other river management agencies and the community to improve the management of rivers and their catchments is compelling:

1. The *NSW Rivers Survey* (Harris and Gehrke, 1997) found stocks of native fish to be generally in a degraded state, with poor biodiversity in many inland regulated rivers. Many once-common species have become regionally extinct across vast areas of their former range, such as silver perch. Introduced species such as carp and trout were found to be widespread and abundant;

2. Seven species of native fish in inland and coastal waterways are listed, or are in the process of listing, as threatened on Schedule 5 of the FM Act (see Table 1);
3. The aquatic ecological community of the regulated reaches of the Murray, Murrumbidgee, Edwards and Wakool Rivers has been listed as an endangered ecological community under the FM Act;
4. The New South Wales State of the Environment Report 2000 states that "Freshwater rivers in NSW may be the most degraded ecosystems in large part due to the impact of river regulation from dams and weirs…. [and] there is very little formal protection for freshwater ecosystems compared with terrestrial ecosystems" (EPA, 2000, p. 6);
5. The report "Threatened and Potentially Threatened Native Fishes of Coastal New South Wales and the Murray Darling Basin" (Morris et al, 2000) concluded that habitat degradation, changes to water flow regimes, barriers to fish passage, the introduction of alien fish species, and fishing pressure have caused significant declines in the diversity and abundance of native fish in the Murray Darling Basin (p. vi).

2.3 Conservation Status of Freshwater Fish in NSW

The main cause for the severe decline in the distribution and abundance of fish is habitat degradation, as reported by Harris and Gehrke (1997), and Morris et al (2000). The survey demonstrated the generally poor state of native fish stocks, with almost one- third of species known to have occurred in NSW rivers not recorded over the two year study. Species once considered widespread and relatively common were found to have either restricted distributions or were found to be absent from large areas. Six species and two populations are now listed as threatened in NSW (Table 1). The Aquatic Ecological Community in the Drainage System of the lower Murray Catchment has also been listed as an Endangered Ecological Community on Schedule 4 of the FM Act.

2.4 Conservation status and distribution of threatened native freshwater fish in inland NSW

The conservation status of species listed as threatened under the New South Wales *Fisheries Management Act 1994* are provided in Table 1.

Table 1: Threatened fish species listed on Schedule 5 of the *Fisheries Management Act 1994*. The probable causes of decline are listed for each species. V=vulnerable, E=endangered (Source: Fisheries Scientific Committee: www.fsc.nsw.org.au, Wager and Jackson, 1993; Koehn and O'Connor, 1990; Lintermans, 2000).

Fish species	Trout cod	Murray hardyhead	Purple spotted gudgeon (Western pop.)	Olive perchlet (Western pop.)	Silver perch	Macquarie perch	Southern pygmy perch
FMA status	**E**	**E**	**E**	**E**	**V**	**V**	**V**
Habitat degradation	*	*	*	*		*	*
Barrier to fish passage		*	*		*	*	
Alteration to flow regime	*		*	*	*		*
Desnagging	*						
Exotic species	*	*	*	*	*	*	*
Thermal pollution	*	*		*		*	*
Pollution (sediments, nutrients)	*						
Overfishing	*					*	

The known distribution of threatened inland native fish species is provided below.

Trout cod: The current extent of the trout cod population is restricted to a single natural sub- population in the Murray River from Mulwala to Tocumwal, and a single restocked population in Seven Creeks, Goulburn River system, Victoria. Trout cod have also been stocked in various southern Murray- Darling Basin rivers, but these populations appear not to be self- sustaining (Morris et al, 2000, p.68).

Murray hardyhead: Specimens were recorded in 1986 in the lower River Murray, but the species seems to now be restricted to Kerang Lakes are in Victoria, Lake Hawthorn in Victoria, Cardros Lakes near Mildura, and other billabongs that flood frequently near Mildura (Morris et al, 2000, p. 45). Currently there is no known surviving population in NSW (FSC, 2001).

Silver Perch: The last remaining secure and self- sustaining population in New South Wales occurs between Torrumbarry and Euston Weirs on the River Murray (Clunie and Koehn, 2001a). There are unconfirmed reports that the population may have expanded upstream through the fishway on Torrumbarry weir (J. Koehn, Victorian Department of Natural Resources and Environment, pers. comm., 2001). Silver perch are stocked in a

range of impoundments (NSW Fisheries, 2001). Smaller populations have also been recorded in the Barmah forest, Edwards River, at Yarrawonga weir on the Murray River, in the Darling and Paroo Rivers, near Goondiwindi on the Macintyre River, and between Narrandera and Wagga Wagga in the Murrumbidgee River (Morris et al, 2000, p. 77).

Macquarie perch: Distribution is now fragmented and much reduced. It occurs in the upper Murrumbidgee, Murray, Queanbeyan, and Goodradigbee, Molonglo, Paddys and Cotter, and Abercrombie Rivers (Morris et al, 2000).

Southern pygmy perch: This species is now absent from the Murrumbidgee system, and in the Murray River the population only occurs in a few billabongs and creeks within the Albury area, and from Billabong Creek in the Holbrook area (FSC, 2001). It appears to be close to extinction in NSW (Morris et al, 2000, p.88).

Purple-spotted gudgeon: the distribution in the NSW section of the Murray-Darling Basin river system (western population) is very limited, to the extent that this population is considered to be in immediate danger of extinction. Recent recordings have been made in afew streams around the NSW/ QLD border, near Inverell, and Tenterfield, and the Gwydir River and Bingara (Morris et al, 2000, p.103).

Olive perchlet: The distribution of the western population in the Murray- Darling Basin system now appears limited to a few locations in the Darling drainage upstream of Bourke (FSC, 2001), including Severn and Macintyre Rivers on the NSW/ QLD border, the Dumaresque River near Bunshaw, and in the Bogan River near Gongologon and Nyngam (Morris et al, 2000, p. 54).

3. Legislative and policy frameworks pertinent to the creation of a system of a system of freshwater aquatic reserves in NSW

The creation of a comprehensive, adequate and representative reserve system forms a core component of biodiversity conservation (Council of Australian Governments, 1992). The *Intergovernmental Agreement on the Environment 1992* between the Commonwealth and States expressly provides for the establishment of aquatic reserves in freshwaters. In later legislation and policies enacted by the States this provision has been largely ignored. Further, little or no funding has been provided for programs aimed at establishing such reserves, and comprehensive inventories of representative freshwater areas remain incomplete (Nevill, 2001).

3.1 New South Wales Legislation, Policies and Strategies

3.1.1 Fisheries Management Act 1994 (NSW)

The objects of the FM Act are to "conserve, develop and share the fisheries resources of the state for the benefits of present and future generations" (section 3). In particular, some of the objects are to conserve fish stocks and protect key habitat; to conserve threatened species, populations and ecological communities of fish; and to promote quality recreational fishing opportunities (Part 1(3)). The FM Act contains specific provisions for the establishment of aquatic reserves, on crown or freehold land. It also contains provisions for the establishment of areas of critical habitat for endangered species, and provisions relevant to threatened species and protection of their habitat.

The Act was amended in late 1997 to include threatened species provisions, and again in November 2001 to provide for, among other provisions, the production of management plans for aquatic reserves.

Aquatic Reserves

Part 7, Division 2 of the *Fisheries Management Act 1994 (NSW)* provides an adequate framework for the establishment of aquatic reserves in freshwater to enhance the protection of fish and fish habitat, through the protection of significant habitat and for the conservation of threatened species (Smith and Pollard, 1999).

Section 194(2) states that 'The purpose of declaring an area to be an aquatic reserve is to conserve the biodiversity of fish and marine vegetation and, consistently with that purpose:

(a) to protect fish habitat in the reserve, or

(b) to provide for species management in the reserve, or

(c) to protect threatened species, populations and ecological communities in the reserve, or
d) to facilitate educational activities and scientific research.'

The regulations relating to aquatic reserves may:
(a) prohibit or regulate the taking of fish or marine vegetation from aquatic reserves, and
(b) provide for the management, protection and development of aquatic reserves, and
(c) classify areas within an aquatic reserve for different uses (such as recreational uses or as a sanctuary) (s 197).

Aquatic reserves can be declared over any land or waters, provided consent has been gained by the Minister from the landholder (when private land is involved) or relevant department (for and area of public water or land) (s. 195). NSW Fisheries declare aquatic reserves for a number of reasons, including for the "protection and management of important habitat for commercially and recreationally important species" (MPA, 2000, p. 15). The establishment of aquatic reserves will necessitate significant consultation with landholders and public authorities. Further, the provisions enable zonation within aquatic reserves, allowing a measure of management flexibility. Current marine aquatic reserves allow conservation, scientific, educational and recreational activities and in general restrict fishing activities (HPP No.1, 1995).

Habitat Protection Plans

Part 7, Division 1 of the FM Act provides for the preparation and gazettal of Habitat Protection Plans (HPP), which may provide some of the outcomes envisaged by the establishment of FARs. However, as documented below, existing HPPs do not provide regulatory tools adequate to the task facing NSW Fisheries in rehabilitating freshwater rivers.

HPPs may be determined for the protection of any habitat of fish, whether the habitat is essential for the survival of the species or required to maintain harvestable populations of the species (s 192 (1)). HPPs could be used to complement a FAR, as they relate to an area essential for survival or maintenance of harvestable populations, may apply generally or to particular areas of fish, and may contain methods for protection and other relevant matters, including the importance of the habitat features (s 192 (2)).

Once implemented, the Minister and public authorities are to have regard to any relevant HPP in the exercise of their functions, as the plan applies to a number of activities including desnagging, destruction of the riparian zone, and wetland reclamation (s 193 (1)-(2)). However, the exercise of a function by any person or public authority is not invalid merely because it is inconsistent with a HPP (s 193 (5)). For example, little control is exerted over snag management in existing legislation, and the HPP requires only notification before desnagging is carried out. This provision significantly weakens the credibilty of the HPP.

Of the three habitat protection plans currently in place only the first is relevant to inland rivers. This plan, HPP No. 1 is an advisory document that provides a general summary of the protective measures available in this piece of legislation, and also specifically protects snags (Smith and Pollard, 1999). The relevant objectives of HPP No.1 are: to provide

protection, where necessary, for all fish habitat; to establish a requirement for public authorities proposing snag removal to notify the Minister. This plan applies to all waters to which the *Fisheries Management Act 1994 (NSW)* applies, and so includes wetland and snag habitats. All habitats listed in the HPP have been shown to be important in the life cycles of one or more species of fish.

Threatened Species Conservation general provisions

The FMA was amended in late 1997 to incorporate principles and processes similar to those embodied in the *Threatened Species Conservation Act 1995 (NSW)* for the conservation of threatened fish species (NPWS, 1999). This amendment inserted Part 7A into the *Fisheries Management Act 1994 (NSW)*, which providing for:

- the conservation of fish biodiversity;
- the promotion of ESD,
- the prevention of species extinction and the promotion of the recovery of threatened species;
- the protection of critical habitat,
- the management of threatening processes;
- encouraging the conservation of threatened species, populations and ecological communities (s 220A).

The amendments require the preparation and implementation of recovery plans and threat abatement plans* for species, populations (population of vulnerable species Schedule 5) and ecological communities classified as endangered a recovery plan to be prepared for all species listed as threatened under this legislation (Smith and Pollard, 1999).

Critical Habitat

Part 7A, Division 3 of the *Fisheries Management Act 1994 (NSW)* provides for the protection of habitat critical to the survival of an endangered species, population or ecological community (s 220P), where habitat means any area occupied, or periodically or occasionally occupied, by fish.

No critical habitat has been declared in NSW under the FM Act. Similar reluctance on the part of fish management agencies to declaring critical habitat occurs in the US, with declarations usually made only following litigation by conservation groups for enhanced fish protection (Weiner, 1995). Much of the contention arises as the declaration of an area as critical habitat causes property devaluation. Critical habitat can be imposed on private land with only superficial public consultation compared to the requirement to gain consent from private landholders for the declaration of aquatic reserves (ss. 195 and 220R). Accordingly the declaration of critical habitat is not the preferred method of establishing aquatic protected areas, and the aquatic reserve framework is, in most circumstances, a more suitable form of protection. Further, the scope of critical habitat provisions is limited to the protection of *endangered* species, populations or ecological communities. Arguably the aquatic biodiversity conservation goals of NSW Fisheries would be more adequately

* Amendments were also made to the *Environmental Planning and Assessment Act 1979* introducing a number of responsibilities upon consent authorities in regard to threat abatement planning.

addressed through a system of FARs than critical habitat. This provision does, however, provide the scope for limited protection over private areas if required (Nevill, 2001).

3.1.2 NSW Aquatic Biodiversity Strategy

The *NSW Biodiversity Strategy 1999* states that the development of a system of freshwater reserves is to be addressed by the *Aquatic Biodiversity Strategy*, currently being drafted by NSW Fisheries (as an additional component to this Strategy) (Nevill, 2001; NSW Fisheries, 2001). Unfortunately the draft Aquatic Biodiversity Strategy fails to commit to a system of FARs.

3.1.3 NSW Biodiversity Strategy

Objective 2.2 of the NSW Biodiversity Strategy is to "Establish a comprehensive, adequate and representative reserve system". Whilst there is no specific mention of freshwater, Priority Action 18 states that in the expansion of the protected area in NSW emphasis will be on priority bioregions and targeting *poorly conserved ecosystems* which are most under threat, which would obviously include freshwater ecosystems.

3.1.4 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974 (NSW)* provides for the protection of private land as a private reserve under a voluntary conservation agreement (VCA) (similar to a covenant) (s 69). VCAs are a type of management agreement that involves negotiations between the landholder and NSW Minister for Environment to form a binding contract. An agreement may be formed over land worthy of preservation; for the purpose of the study, preservation, protection, care or propagation of fauna; for the purpose of the conservation of critical habitat or the conservation of threatened species, populations or ecological communities, or their habitats (s 69b-c). VCAs are aimed at preserving conservation values of private land and may provide an avenue for effective, flexible protection of freshwater areas that adjoin private land (NPWS, 1999). Not only do they allow for the coexistence of conservation and private land use[*], they could enable the establishment of a freshwater reserve without the need for expensive compulsory acquisition, overcoming potentially difficult land tenure issues. Of further incentive to landholders, recent amendments to the *Local Government Act 1993* have empowered councils to offer rate rebates on land under a VCA, thereby making those landholders exempt (or partially exempt) from rates and charges (NPWS, 1999).

3.1.5 NSW Wetlands Management Policy

As with the Commonwealth Wetlands Policy, the NSW Wetlands Policy is limited in scope by its definition of wetlands, including only areas with slow or stationary water (Nevill, 2001). However, action statement 8.3 states that the "representation of all wetland types, within the reserve system will be secured" (DLWC, 1996).

[*] A conservation agreement may contain terms binding on the owner (e.g. restricting use and activities, financial contribution) or Minister (e.g. financial and/ or technical assistance), from time to time (s 69C (2)).

3.2 National Legislation, Policies and Strategies

3.2.1 National Strategy for the Conservation of Australia's Biological Diversity

Objective 1.4 of the National Strategy is to:

> *"Establish and manage a comprehensive, adequate and representative system of protected areas covering Australia's biological diversity"*.

This objective is later reinforced in Principle 8:

> *"Central to the conservation of Australia's biological diversity is the establishment of a comprehensive, representative and adequate system of ecologically viable protected areas, integrated with sympathetic management of all other areas"*.

The term "protected area", as defined in the UN Convention on Biological Diversity, applies equally to terrestrial, freshwater and marine ecosystems (Nevill, 2001). Biological diversity "covers … terrestrial, marine and other aquatic environments" (Council of Australian Governments, 1996, p. 2).

3.2.2 Intergovernmental Agreement on the Environment (1992)

Schedule 9 (Nature Conservation) of the Intergovernmental Agreement on the Environment (IGAE) explicitly provides for the creation of a CAR system of freshwater reserves. Item 13 of the IGAE states that:

*"The parties agree that a representative system of protected areas encompassing terrestrial, **freshwater**, estuarine and marine environments is a significant component in maintaining ecological processes and systems. It also provides a valuable basis for environmental education and environmental monitoring. Such a system will be enhanced by the development and application where appropriate of nationally consistent principles for management of reserves"* (emphasis added).
(Commonwealth of Australia, 1992)

3.2.3 National Strategy for Ecologically Sustainable Development

Objective 10.1 states:
*"To establish across the nation a comprehensive system of protected areas which includes representative samples of **all major ecosystems**, both terrestrial and **aquatic**; manage the overall impacts of human use on protected areas; and restore habitats and ameliorate existing impacts such that nature conservation values are maintained and enhanced"* (emphasis added). (ESDSC, 1992)

3.2.4 National Reserve System

The National Reserve System (NRS) Program is a key mechanism for enabling Australia to meet its international commitments under the Convention on Biological Diversity (Nevill, 2001). The NRS provides excellent opportunities for the development of a system of FARs, as its goal is to establish a CAR system of protected areas. Further, this system provides for the consideration of both public and private land for protected area status. The NRS program provides an avenue through which issues for priority funding could be identified, and could also help direct Natural Heritage Trust funding for the States to complete inventories of freshwater ecosystems. NRS funds have provided for the

establishment of representative terrestrial ecosystems, and have also been used to acquire a number of wetland areas, although this has been done in an ad- hoc manner (Nevill, 2001). However, as yet no money has been allocated through this program to support the establishment of either representative freshwater reserve systems or river reserves of any kind.

3.2.5 Australian National Strategy for the Conservation of Australian Species and Communities Threatened with Extinction

Action 6.3 states:

> *Where appropriate, reserv[e] for conservation purposes endangered and vulnerable ecological communities and critical habitats of endangered and vulnerable species that are threatened by inadequate representation in reserve systems* (Endangered Species Advisory Committee, 1992).

3.2.6 Commonwealth Wetlands Policy

The Commonwealth Wetlands Policy uses a variant of the Ramsar definition for wetlands that excludes rivers, and does not identify the need for a CAR system of wetland reserves (Nevill, 2001). The Policy commits the Commonwealth to work with the States to develop a wetlands inventory, and has the expectation that the approach taken to wetland conservation and management in the Commonwealth policy will be achieved by the States developing their own wetland policies.

3.3 International Agreements

3.3.1 UN Convention on Biological Diversity (1992)

Article 8 of the UN Biodiversity Convention calls for the contracting parties' to

> *"Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity"* and to *"Develop or maintain necessary legislation and / or other regulatory provisions for the protection of threatened species and populations"*.

3.3.2 Ramsar Convention (1971)

The Australian Government is a party to the International Convention on Wetlands (the 'Ramsar Convention'). Listing of a wetland on the Ramsar list commits the nominating country to undertake special measures to ensure protection of the values for which it was listed. "Wise use" is a key principle of the Convention[2]. Under Ramsar's *Criteria for identifying wetlands of international importance*[3] the need to identify "representative or

[2] The Convention defines "wise use" as: "sustainable utilisation for the benefit of humankind in a way compatible with the maintenance of the natural properties of the ecosystem", UNESCO (1971:iii).

[3] According to the Ramsar strategic framework for site designation, a wetland is identified as being of international importance if it meets at least one of a list of criteria. The first item on the list is:

Criteria for representative or unique wetlands

A wetland should be considered internationally important if:

(a) it is a particularly good representative example of a natural or near-natural wetland, characteristic of the appropriate biogeographical region;

(b) it is a particularly good representative example of a natural or near-natural wetland, common to more than one biogeographic region;

unique wetlands" is highlighted. This criteria *cannot be applied* in the absence of comprehensive inventories which embody classifications of wetland type[4]. After 30 years, Australia has fulfilled only part of its obligations under the Convention, as even though Australia has 49 wetlands on the Ramsar list, comprehensive wetland inventories and comprehensive national reserve systems remain incomplete (Nevill, 2001).

The definition of "wetlands" used in the Ramsar convention encompasses **all** freshwater ecosystems, and so includes all flowing waterways, such as rivers and streams[5]. This definition is in direct contrast to the meaning adopted in Australian policies which excludes such water bodies. However, in order to fulfil Australia's obligations under Ramsar, programs need to be developed covering all those ecosystems which are encompassed by the full Ramsar definition.

Further, under the *Selected Criteria for designating Wetlands of International Importance under the Ramsar Convention on Wetlands* there are two criteria that apply specifically to the protection and management of fish and fish habitat, plus one which provides for the protection of threatened species and communities.[6].

3.4 Case Studies

3.4.1 Canadian Experiences

Several freshwater reserves and parks have been successfully designated in Canada, although such ecosystems have not received significant attention[7]. Two ecological reserves in British Columbia (BC) have been established primarily to protect freshwater fish species[8] (Morrison, pers. comm, 2001). In ecological reserves fish populations are protected as all consumptive uses are prohibited. Further, freshwater ecosystems are the

(c) it is a particularly good representative example of a wetland which plays a substantial hydrological, biological, or ecological role in the natural functioning of a major river basin or coastal system, especially where it is located in a transborder position; or
(d) it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographic region.
(Source: Commonwealth of Australia 1997, page 38).

[4] The criteria are listed and discussed in Dunn (2000) section 2.4, with additional reference to marine programs.

[5] The Ramsar Convention on Wetlands of International Importance, to which Australia and 99 other nation states are signatories, defines wetlands as:"areas of march, 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 metres".

This definition has been generally accepted by the Australian Commonwealth and States, with one important modification made by the Commonwealth, Victoria and New South Wales: the *exclusion* of permanent rivers and streams. For further discussion of the question of definition, see Commonwealth of Australia 1997:29,47.

[6] see Appendix A (2) for details of the relevant criteria

[7] A recent meeting of the Canadian Council on Ecological Areas concluded that increased attention throughout Canada need to be directed to freshwater ecosystems in protected areas (Morrison, K. pers comm, 2001)

[8] Drizzle Lake Ecological Reserve, for stickleback populations, and Misty Lake Ecological Reserve for the Giant Black Stickleback

main feature in many BC parks, where there are legislative provisions to ensure habitat protection, and a number of activity restrictions, such as a zero retention of certain species and reduced modes of access[9].

Through the utilisation of Provincial legislative provisions that are very similar to provisions in NSW, a number of provinces have established freshwater protected areas. Voluntary agreements have been used to overcome reticence by landholders (similar to voluntary conservation agreements provided for in the *National Parks and Wildlife Service Act 1974 (NSW))*. Recently, some provinces have taken a 'protection by example' approach to encourage public participation (Environment Canada, 2001). This has been accomplished through education, provincial policies, and legislation that provides for stewardship agreements, conservation easements[10] and conservation covenants[11]. For example, the Ontario *Conservation Land Act* encourages private landholders to act as stewards on natural areas through the payment of grants. The government or partner organisation provides payment for the covenant or agreement and/ or other benefits, such as a reduction in property taxes.

3.4.2 IUCN Experiences

The International Union for the Conservation of Nature has established freshwater reserves in a number of countries with varying success (such as Uganda, Mauritania, various countries in Meso-America, and Canada). Success has depended upon local conditions that dictate the manner in which the ecosystems are protected and practical measures instigated. Wide consultation has enhanced the degree to which aquatic reserves are implemented, complemented by research into best management practices. The use of financial incentives and the establishment of new semi- governmental institutions to deal specifically with reserve management has also improved success rates. Reserves usually consist of a core with strictly regulated activities, surrounded by a buffer zone with less stringent regulation (Bos, pers. comm., 2001).

3.4.3 Reserve establishment examples in Australia relevant to FARs

As yet the only serious attempts at establishing freshwater reserve systems have been made by Victoria and the Australian Capital Territory (Nevill, 2001). These programs have established – though not implemented - heritage rivers and representative rivers in Victoria (see below) and a number of river and wetland reserves in the ACT.

A number of States, including Victoria, Western Australia, South Australia, the Northern Territory, and to a more limited extent the ACT, have legislation containing provisions for the establishment of FARs (see *Fisheries Act (1982)* (SA), Wager and Jackson, 1993; and Nevill, 2001, for more details). Whilst most State programs do deal with the need for representative reserves, there is little or no State funding provided for the development of reserves, rendering these programs ineffective, and commitments inadequately met.

[9] This does not currently include "no fishing" restrictions

[10] An easement is a legal agreement which restricts the amount and type of development and land- use of area. They can be for a specific time or in perpetuity- i.e. binding on the current owner and future owners

[11] A conservation covenant is a voluntary but binding agreement between the landowner and the governmnet or conservation organisation to conserve land or particular aspect or feature of land. It restricts what people can do to their land, and they are usually in perpetuity.

3.4.4 *Heritage Rivers Act 1992* (Victoria)

Victoria is the only state to have formalised a riverine reserve system through legislation: the *Heritage Rivers Act 1992*. The Heritage Rivers Act was developed from the Heritage Rivers Program[12], one of the aims of which was to ensure the protection of representative examples of stream types. When initially developed, it was expected that protection would be gained through Crown land management plans, land-use planning mechanisms to provide controls on private land, and in some situations formal agreements with landholders, so recognising the critical importance of protection on both Crown and freehold land (Nevill, 2001). The Program resulted in the establishment of fifteen "Representative Rivers" that are protected, in theory, by the establishment of management plans and programs. The Program also resulted in the establishment, through the Heritage Rivers Act, of a number of "Natural Catchments" and "Heritage Rivers".

Unfortunately there are substantial problems in regard to Heritage Rivers and Representative Rivers, as the management plans prepared for the Heritage Rivers have never been finalised (after 9 years), and four of the fifteen management plans required for the Representative Rivers have never even been drafted (Nevill 2001). While the Victorian program showed initial promise, the outcome has fallen significantly short of expectations and the entire program needs urgent review. While the Victorian Government has been preparing a Healthy Rivers Strategy for about 2 years, a public discussion draft is yet to be released, and it is unclear whether this opportunity will be taken to revise Victoria's FAR program.

3.4.5 ACT Murrumbidgee River Corridor

In the ACT the full length of the Murrumbidgee River is managed primarily for nature conservation as the Murrumbidgee River Corridor, as all land along the banks are linking nature reserves (Lintermans, 2000). This river corridor protects the riparian zones and restricts bank and river development, which in turn protects a number of in- stream values.

3.4.6 Vegetation Protection on Private Land in NSW

Throughout Australia management agreements (MA) (which include such mechanisms as covenants) are used to promote vegetation conservation on private land, and have generally achieved outstanding results, despite very limited funding (Binning and Young, 1997). MAs are usually voluntary agreements, and importantly are complemented by an incentive scheme. Financial incentives could include reimbursement of management costs, compensation for foregone land- use opportunities, indirect payment such as a tax reduction or rate rebate. States that have provided financial assistance and/ or used legislation to trigger agreement entry have proved far more successful in MA initiation (Binning and Young, 1997). Further, as MAs are a contract, they have the potential to prove flexible to each unique situation.

Similar agreements should be advocated for the protection of freshwater systems, through agreed activity restrictions and riparian and bed protection. Through the use and provision of education, incentives, consultation and flexibility, a similar freshwater arrangement could prove just as successful and provide an avenue that allows current land tenure and user issues to be overcome.

[12] This was developed from objectives cited in the 1987 Victorian Nature Conservation Strategy

3.4.6 Philippine Experiences

Experience with Marine Reserves in the Philippines, particularly reserves with no- take zones, has demonstrated how effective such protection measures can be for the health of fish communities and increased fish productivity (Alcala, 2001). A number of very effective reserves have been established in the Philippine region (Apo Island Marine Reserve in particular), with strong community support following clear evidence of increased catch returns from the non- reserve areas due to a 'spillover' of adult fish from the no- take zone. Further advantages have included increased tourism due to the abundance and diversity of marine life in the no- take zone. Due to the success of initial reserves, communities have been willing to maintain effective control and management over the reserves, which has ensured simple and rapid establishment of subsequent reserves.

3.4.7 Protection of Marine Areas in NSW

There are four types of protected areas in NSW marine environments: Marine Protected Areas, administered by NPWS and NSWF; Aquatic Reserves, administered by NSWF, Fish closures, administered by NSWF, and marine extensions to terrestrial reserves, which are administered under a memorandum of understanding between NSW Fisheries and NPWS.

Protected areas will only be effective if scope is provided for an effectively-sized no take / sanctuary zone, and the Australian Committee for IUCN believes that the most effective protection is gained from the establishment of a large area managed for multiple- use and including adequately sized sanctuary zones (ACIUCN, 1994). Unfortunately current aquatic reserves in NSW have not proved very effective as protection has been weak with very small or no no-take zones. a similar situation exists for MPAs, where potential effectiveness has been watered down through inadequate no-take zone designation. For example, in the Solitary Islands Marine park only 0.25% of the park area will be a no-take zone (MPA, 2001).

However, MPAs have proved somewhat more effective due to the fact that the Marine Parks Authority, which administers Marine Protected Areas (MPAs) in New South Wales under the *Marine Parks Act 1997*, is under the joint management of NSW Fisheries and the NSW National Parks & Wildlife Service. Most MPAs are multiple-use with varying types and degrees of restrictions to fishing activities. Studies on ecosystem benefits of MPAs have indicated a dramatic improvement in species diversity, numbers, and general ecosystem health, demonstrating the remarkable success achievable through the establishment of protected areas[13].

Otway and Parker (2000) have recently considered the establishment of MPAs for the protection of grey nurse sharks. Despite the migratory nature of the species, the establishment of MPAs was evaluated as important to assist the species' conservation through the protection of aggregating sites, allowing a large percentage of the population to receive a high degree of protection. This is a valuable indication of the importance of reserves for all fish species, including migratory species.

[13] For example, the study of the Bouddi National Park Marine Extension, as documented by Gladstone (2001).

Nationwide, fisheries management agencies recognise the importance and need for MPAs, due to their vital role in ensuring that the ESD objectives are met in regard to fishery resources, integral in managing resources for the future (Exel, 1996). Such reserves are seen as an effective way to ensure that resource biodiversity is protected, whilst also allowing the sustainable use of these resources. Without effective fish habitat protection the future of fisheries and aquatic biodiversity is severely compromised and threatened.

4. Establishing a System of Freshwater Aquatic Reserves in New South Wales

A comprehensive, adequate and representative system of FARs should be established as a priority for the conservation of aquatic biodiversity and habitat in NSW. FARs should provide adequate protection for freshwater ecosystems spanning the range of biogeographic regions in the state. A biogeographic regionalisation needs to be undertaken to provide a basis for establishing FARs.

4.1 Objectives of FARs

All types of protection areas, including aquatic reserves, should be selected, declared and managed using guidelines being developed under the Aquatic Biodiversity Strategy. Management objectives should include developing a CAR system of reserves:

The management objectives of FARs could be to

1. protect aquatic habitat and biodiversity in the reserve (FM Act, section 194(2)), or
2. provide for species management in the reserve, such as angling restrictions (FM Act, section 194(2)), or
3. protect threatened species, populations and ecological communities in the reserve (FM Act, section 194(2)), or
4. protect river reaches supporting species that are rare or have a limited distribution, or
5. facilitate educational activities and scientific research (FM Act, section 194(2)), or
6. raise awareness amongst the general community regarding river health, or
7. manage and conserve aquatic ecosystems in pristine condition, particularly streams classified as High Conservation Value, or
8. provide NSW Fisheries with a stronger role in managing rivers and catchments, particularly in delivering environmental flows, mitigating thermal pollution from dams and providing fish passage, or
9. provide for complementary management of reserved freshwater ecosystems in association with terrestrial reserves and Ramsar-listed wetlands.

Establishment of a system of FARs would enhance NSW Fisheries' capacity to manage aquatic biodiversity and habitats within the boundaries of the reserves. Yet the broader implications for NSW Fisheries' involvement and influence in river management are potentially even more significant for aquatic biodiversity conservation. A system of FARs would provide NSW Fisheries with an enhanced role in the development of river and catchment management plans than it currently enjoys. In the same way that designation of a Ramsar-listed wetland affords the National Parks & Wildlife Service with a strong role for ensuring adequate flows from upstream, a system of FARs would provide NSW Fisheries with a much stronger role in river management.

At present NSW Fisheries lacks sufficient specific areas upon which to focus joint research and management efforts. Management plans for FARs would provide a useful means of implementing recovery plans for threatened species and communities and threat abatement plans listed under the FM Act.

As found in experience with marine protected areas, FARs would prove most effective if greater communication and joint- management occurred between NSWF and NPWS. NPWS in particular should have a strong role in FAR management, due to the mutuality of conservation aims. There needs to be the establishment of a FAR working group between NSWF and NPWS to conduct and refine options and investigations, including drafting a FAR Strategy. Such a partnership will ensure that there is a greater link between terrestrial and aquatic in- situ conservation, and could encourage supportive terrestrial protection for the FARs. Further, it would utilise the NSWF MPA experience and protection area management from NPWS.

4.2 Levels of protection and management actions within a FAR

The following three categories of FARs are proposed. They correspond to three of the IUCN categories of Protected Areas (Environment Australia, 2001). Examples of works or actions are provided to indicate the level of intervention and the extent to which management objectives include addressing ex-situ conservation issues. The management goals of higher level categories could include some or all of those in lower level categories.

The three IUCN Protected Area categories are listed in order of decreasing management requirements and on-ground actions. Proposed management actions and conditions of access and use to a river and its resources are suggested. The goals accord with those of the IUCN Protected Area Categories (see Environment Australia, 2001). The management actions and conditions broadly address the threatening processes listed in Table 1.

4.2.1 Category II: Protected Area managed mainly for ecosystem conservation and recreation. This category provides the highest level of protection. It should be considered the default option for most FARs.

GOAL: A natural area designated to:

(d) protect the ecological integrity of one or more ecosystems for this and future generations, and

(e) exclude exploitation or occupation inimical to the purpose of designation of the area, and

(f) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible

- **Re-introduction of locally extinct species**. Many species have become regionally extinct throughout inland NSW. FARs could be used for careful re-introduction of regionally-extinct species.
- **No take zones.** Complete angling closures could be declared across some or all of a FAR, though for many species angling pressure is not a major concern.
- **Exclusion of powerboats.** Wakes created by speedboats seriously degrade aquatic vegetation and the fauna which rely upon plants for habitat and protection. Anecdotal evidence indicates noisy boats also scare fish. Access to some or all of the waterway could be restricted to boats with small engines and canoes to encourage passive boating.
- **Remove / modify weirs.** Weirs within a FAR, or upstream or downstream of a FAR which block fish passage, alter flow patterns, encourage exotic species, or create erosion and salinity problems could be modified or removed, or targeted for the addition of a fishway. Weir manipulations could be required which accord with the objectives of the FAR.
- **Mitigate thermal pollution**. Bottom-release dams that thermally pollute a FAR could be targeted for mitigation.

4.2.2 Category IV: Protected Area managed mainly for conservation through management intervention. This category provides an intermediate level of protection.

GOAL: Area subject to active intervention for management purposes so as to ensure the maintenance of habitats and/ or to meet the requirements of specific species.

- **Powerboat management**. Restrictions on powerboat access and speed limits would encourage quieter and less damaging boats (see above).
- **Deliver environmental flows**. Improved flow management is central to the management and rehabilitation of many inland rivers, with the Fisheries Scientific Committee identifying changes to flow patterns as a key threatening process. Improved flow management upstream of a FAR could be a key management tool.
- **Control of exotic species**. Management and / or removal of introduced plant (willows, blackberries, burrs, lippia, etc) and animal pests (carp, redfin, trout, mosquito fish).
- **Improved management of agricultural run-off and irrigation drainage**. Tighter controls on discharge from irrigation drains which discharge into or upstream of a FAR, mandatory construction of wetlands to filter drainage discharge, and establishment of vegetation buffer strips along agricultural lands is a key river rehabilitation tool.
- **Construction of fishways on weirs**. Addition of fishways on weirs near a FAR, which prevent or obstruct fish passage into the FAR, particularly for threatened species, could be key management objective.

4.2.3 Category VI: Protected Area managed mainly for the sustainable use of natural ecosystems. This category provides the lowest level of protection.

GOAL: Area containing predominately unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing for the same time a sustainable flow of natural products and services to meet community needs.

- **General habitat rehabilitation.** To enhance the capacity of the river to provide natural products (for example, increased recreational fish catch of native fish species) and services (for example, improved amenity and water quality) arising from improved river health.
- **Communication to the local community of fish conservation matters**. Construction of riverbank signs and distribution of fact sheets and occasional newsletters to the local community and visitors regarding fish and habitats present in the FAR, plus management aims.
- **Riparian zone protection.** Stock management and exclusion along sensitive riverbanks and wetlands / billabongs, with provision of off-creek watering where required. Management of remnant vegetation and re-vegetation.
- **Angling restrictions**. Increased restrictions on recreational and commercial fishing, such as longer closed seasons or lower bag limits, particularly during the spawning season. For example, the closed season on Murray cod in the River Murray (1 September to 31 October) could be extended to mid December.
- **Scientific research and monitoring.** Research and management programs for aquatic biodiversity and river management could focus upon FARs, such as for re-snagging or the effectiveness of recovery plans. FARs declared over high quality habitats could also fulfil the role of reference sites for the purposes of long-term monitoring programs.
- **Re-snagging and protection of snags**. Snags are essential habitat for many fish and other aquatic fauna, with potentially hundreds of thousands of snags having been removed from rivers in southern NSW. Re-snagging will be a key component of recovery plans for some species (such as trout cod) and could be implemented in FARs.

4.3 Site selection

Reserve selection could usefully be based upon a biogeographic regionalisation of freshwater ecosystems, as used in terrestrial reserve selection (Council of Australian Governments, 1996). A CAR system of FARs could be established which ensured representation across headwater streams, constrained reaches, braided and anastomosing reaches, floodplains and wetlands/ billabongs. Identification and selection criteria could be based upon those developed for MPAs, and also with consideration of criteria established for the listing of Ramsar-listed wetlands pertinent to fish (Appendices 1, 2).

Practical considerations may require that within a biogeographic regionalisation approach FARs are declared where local landholders and the broader community are supportive. FARs could be more easily established adjacent to or within public or private areas

managed for nature conservation. The locations and rivers highlighted above as supporting threatened species should receive special attention.

The size of FARs should be determined through consideration of the objectives of that particular reserve, taking into consideration factors such as the habitat requirements of the species to be protected and their dispersal requirements (Thackway, 1996). FARs should be large enough to ensure adequate protection of the riverine environment and aquatic biodiversity. FARs which are too small to adequately provide for the protection of a species / community / habitat risk being merely tokenistic. The scale of threats and their impacts should also be taken into consideration, such as the extent of cold-water releases from dams or the quality of riparian vegetation.

4.4 Compatibility of FARs with different land tenures

Establishment of FARs on publicly owned land will be much easier than on privately owned land. Publicly owned lands include National Parks and Reserves administered by the National Parks & Wildlife Service, forestry lands managed by NSW Forests, river channels managed under lease by the Department of Land & Water Conservation, and Pasture Protection Board lands. FARs could be established over rivers and creeks currently administered by one of these public authorities, with a simple transfer of the lease to NSW Fisheries. An example would be the River Murray's bed which is managed under lease by DLWC where it passes though the Barmah-Millewa Forest. Millewa Forest is managed for forestry by NSW Forests, with forestry operations in riparian zones strictly managed to protect waterways. Given that the Barmah Forest (Victoria) is a Ramsar-listed wetland and forestry operations in Millewa Forest provide a high level of protection to riparian and floodplain habitats along the River Murray, and the River Murray supports high fish and habitat diversity in the reach, the site warrants strong consideration for declaration of a FAR. The lease for the Murray's bed could be simply transferred from DLWC to NSW Fisheries.

Privately owned land extends to the edge of rivers and creeks, and sometimes into the channel, throughout NSW. Landholders may be reticent to have a FAR declared over their land. Options include attempting to reach an agreement whereby the landholder agrees to manage her/his land within the FAR in accordance with the goals of the reserve, or purchase of the land. In most cases a FAR may need to extend only the top of the river bank, and the imposition upon landholders of changed management practices or cost of acquiring the land may not be onerous. As discussed above, aquatic reserves can be declared on public and private land. Further, through the existence of agreements such as Voluntary Conservation Agreements (see section on the *NPW Act* above), and Ramsar 'wise use' agreements, there is the potential for much flexibility to allow an effective compromise to be developed between the goals of a FAR and those of the landholder.

5. Recommendations

IRN and ACF recommend that:

1. **A comprehensive, adequate and representative system of FARs be established across rivers and creeks in New South Wales.** Reserve selection should be based upon a biogeographic regionalisation of waterways. As a matter of practicality and within the regionalisation, rivers and creeks which fall within terrestrial reserves already managed for nature conservation should be prioritised for declaration as FARs. The two principle agencies responsible for conserving aquatic species and habitats are NSW Fisheries and the New South Wales National Parks & Wildlife Service (NPWS). IRN and ACF are of the opinion that NSW Fisheries is unable to satisfactorily implement its statutory responsibilities under the FM Act, particularly the conservation of aquatic biodiversity and habitat, and recovery of threatened species and ecological communities, without establishing a CAR system of FARs. Similarly, the NPWS lacks sufficient management tools to conserve species and habitats which occur in aquatic environments for which it has a legislative responsibility under the TSC Act and NPW Act (such as waterbirds, riparian zones, floodplains, freshwater plants, amphibians, reptiles and mammals.) The current level of habitat degradation in the majority of freshwater environments, the impoverished condition of aquatic biota of many rivers and the number of listed threatened aquatic species justifies such a conclusion.

2. Based largely upon the stated purposes of aquatic reserves in the FM Act (cf. section 194), the objectives of FARs could be to
   - protect aquatic habitat and biodiversity in the reserve (FM Act, section 194(2)), or
   - provide for species management in the reserve, such as angling restrictions (FM Act, section 194(2)), or
   - protect threatened species, populations and ecological communities in the reserve (FM Act, section 194(2)), or
   - facilitate educational activities and scientific research (FM Act, section 194(2)), or
   - protect river reaches supporting species that are rare or have a limited distribution, or
   - raise awareness amongst the general community regarding river health, or
   - manage and conserve aquatic ecosystems in pristine condition, particularly streams classified as High Conservation Value, or
   - provide for complementary management of reserved freshwater ecosystems in association with terrestrial reserves and Ramsar-listed wetlands.

3. Three categories of aquatic reserves are proposed in accordance with categories of protected areas endorsed by the IUCN – The World Conservation Union. Potential on-ground management actions or conditions attached to use of the river are proposed below for each category. Proposed management provisions are cumulative with increasing levels of protection. Hence actions and management options applying to aquatic protected areas which provide lower levels of protection (e.g. Category VI reserve) also apply to aquatic protected areas which provide higher levels of protection (e.g. Categories IV and II). Section 4.2 provides details and a rationale for each proposed management provision.

Category II*: Protected Area managed mainly for ecosystem conservation and recreation. This category provides the highest level of protection. It should be considered the default option for most FARs.

GOAL: A natural area designated to:

(g) protect the ecological integrity of one or more ecosystems for this and future generations, and

(h) exclude exploitation or occupation inimical to the purpose of designation of the area, and

(i) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible

- Re-introduction of locally extinct species, particularly threatened species
- Exclusion of angling over some or all of the waterway
- Exclusion of powerboats over some or all of the waterway
- Removal or modification of nearby weirs
- Mitigation of thermal pollution from upstream dams

Category IV: Protected Area managed mainly for conservation through management intervention. This category provides an intermediate level of protection.

GOAL: Area subject to active intervention for management purposes so as to ensure the maintenance of habitats and/ or to meet the requirements of specific species.

- Powerboat management
- Deliver environmental flows
- Control of exotic species
- Improved management of agricultural run-off and irrigation drainage
- Construct fishways

Category VI: Protected Area managed mainly for the sustainable use of natural ecosystems. This category provides the lowest level of protection and may be the most applicable option for highly altered waterways where the goal is to prioritise nature conservation.

GOAL: Area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

- General habitat rehabilitation
- Communication to the local community of fish conservation matters
- Riparian zone protection
- Angling restrictions

* Waterways in wilderness areas or strict nature reserves may be better protected by a Category I reserve, the goal of which is to manage mainly for science or wilderness protection, environmental monitoring, education, and for the maintenance of genetic resources.

- Scientific research and monitoring
- Re-snagging and protection of snags

4. The NSW *Aquatic Biodiversity Strategy* must establish a process for the establishment of a CAR system of FARs, including a timetable for implementation.

16. A Freshwater Aquatic Reserves Working Group needs to be established, jointly staffed by NSW Fisheries and the National Parks & Wildlife Service, to examine and refine options for establishing FARs, including drafting a policy on establishing and managing Freshwater Aquatic Reserves by January 2003. The Working Group would need to develop such a policy with input from other government agencies and public bodies with an involvement in river management, particularly the Department of Land & Water Conservation which administers the NSW *Water Management Act 2000* (WM Act). The WM Act contains several key principles relevant to the establishment and management of FARs, such as protecting and restoring aquatic species and habitats and prioritising the delivery of environmental flows (section 5). The Working Group should conduct community consultation and be advised by a Freshwater Aquatic Reserves Community Reference Panel to be established jointly by the NSW Minister for Fisheries and the NSW Minister for the Environment.

5. The FAR Working Group should determine the level of interest amongst land holders and other members of rural and regional communities to enter into voluntary conservation agreements as a means of establishing FARs over private land.

6. A community consultation process should be undertaken to raise awareness of the need for FARs.

7. The FM Act and NPW Act should be amended as appropriate to enhance the capacity of the NSW Government to establish and manage a system of FARs.

8. Within the proposed biogeographic regionalisation of NSW rivers, and cognisant of the financial, practical and legal constraints pertinent to the declaration of FARs, the following river reaches should be investigated for their suitability:

   - Reaches of the Paroo, Warrego, Barwon and Narran Rivers
   - The River Murray between Echuca and Yarrawonga, in consultation with the Victorian Government
   - Reaches of the upper Murrumbidgee River, in consultation with the ACT Government
   - Reaches of the lower Murrumbidgee River
   - Reaches of the upper Clarence and Richmond Rivers, which support the endangered trout cod
   - Reaches of the upper Gwydir River, which support healthy populations of some native fish species

6. Appendices

A1. Identification and Selection Criteria for Marine Protected Areas

(NSWF, 2001)

Stage One - Identification

The identification criteria used for the selection of candidate sites are based the National Representative System of Marine Protected Areas guidelines for the selection of marine protected areas. The key criteria considered were:

(a) *Comprehensiveness:*
The comprehensiveness of a marine protected area is a measure of the extent to which the area contributes to the conservation of the full range of ecosystems, habitats and species within the bioregion to which it belongs. In selecting a site as a potential marine protected area the following question is considered:
- Does the area add to the coverage of the full range of ecosystems found across the bioregion?

(b) Representativeness:
The representativeness of a marine protected area is a measure of the extent to which the area reflects the range of habitats and biodiversity of communities of the bioregion to which it belongs. In selecting a site as a potential marine protected area the following questions are considered:
- Will the area represent one or more ecosystems found within that bioregion?
- Will the area reflect the species and communities that typify the marine ecosystem the marine protected area seeks to protect?

(c) Ecological Importance / Uniqueness:
The ecological importance of a marine protected area is a measure of the biodiversity of the area. In selecting a site as a potential marine protected area the following questions are considered:
- Does the area contribute to the maintenance of essential ecological processes or life-support systems?
- Does the area contain habitat for rare or endangered species?
- Does the area contain areas on which species or other systems are dependent, eg nursery or juvenile areas or feeding, breeding or resting areas for migratory species?
- Does the area contain unique species, populations, communities or ecosystems?

(d) International / National Importance:
In selecting a site as a potential marine protected area the following question is considered:
- Is the area rated, or have the potential to be listed, on the world or a national heritage list or subject to an international or national conservation agreement?

(e) Biological Productivity:
In selecting a site as a potential marine protected area the following question is considered:

- Do the species, populations, or communities of the area have a high natural biological productivity?

(f) Vulnerability:
In selecting a site as a potential marine protected area the following question is considered:
- Are the ecosystems and/or communities vulnerable to natural processes?

(g) *Naturalness:*
The naturalness of a marine protected area is a measure of the level of protection of the area from human disturbance. This is dependent on the level of human usage of the proposed reserve, and of adjacent land. In selecting a site as a potential marine protected area the following question is considered:
- How much has the area been protected from, or not been subjected to, human induced change?

Stage Two – Selection Criteria

The selection of candidate sites involves a process of community consultation to aid in gathering information about social and economic information. Where possible, the key criteria considered are:

(a) Indigenous interests:
When assessing the indigenous interests in a potential marine protected area the following questions are considered:
Does the site:
- have traditional usage and/or current economic value?
- contain indigenous cultural values?
- have native title considerations?
- have importance for maintaining indigenous ecological knowledge?

(b) Social Interests:
When assessing the social interests in a potential marine protected area, the following question is considered:
- Does the site have existing or potential value to the local, national or international communities because of its heritage, cultural, traditional, aesthetic, educational, recreational or economic values?

(c) Economic Interests:
When assessing the economic interests in a potential marine protected area, the following questions are considered:
Does the site:
- make an existing or potential contribution to economic value by virtue of its protection eg. for recreation or tourism, or as a refuge or nursery area or source of supply for economically important species?
- have current or potential use for the extraction or exploration of resources?
- have importance for shipping and/or trade?
- have usage by traditional users including commercial fishers?
- have value due to its contribution to local or regional employment and economic

development?

(d) Scientific Interests:
When assessing the scientific interests in a potential marine protected area the following question is considered:
- Does the site have existing or potential value for research or monitoring?

(e) Practicality/feasibility The influence of downstream dams and weirs (barriers to fish passage) must be considered, as well as the possibilities and practicalities of managing the effects of catchment landuse on the FAR in question.
When assessing the practicality/feasibility of a potential marine protected area the following questions are considered:
Does the site:
- have a degree of insulation from external destructive influences?
- have social and political acceptability, and a degree of community support?
- have access for recreation, tourism, education?
- have compatibility between a marine protected area declaration generally and existing uses?
- have relative ease of management, and compatibility with existing management regimes?

(f) Vulnerability:
When assessing the vulnerability of a potential site the following question is considered:
- Is the site vulnerable and susceptible to human-induced changes and threatening processes?

(g) Replication
The following question is considered when assessing potential sites:
- Will the site provide replication of ecosystems within the bioregion?

A2. Criteria for designating Wetlands of International Importance under the *Ramsar Convention (1971)* relevant to the conservation of aquatic biodiversity and habitat.

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

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 (emphasis added).

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 (emphasis added).

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