# Policy without action:
## protecting freshwater ecosystems within the Australian landscape.

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> [M]y primary emotion when recalling the past 20 years of environmental law is one of profound disappointment. This disappointment is due to the continuing failure of federal agencies and officials to do a better job of implementing and enforcing our environmental laws… [G]overnment is all too often the environment's worst enemy. Agencies and officials charged with implementing and enforcing our environmental laws frequently fail to do so. They miss statutory deadlines, water down strict legal requirements, or simply refuse to use their enforcement powers, even when faced with blatant violations of the law… [T]he current situation, where laws are implemented, if at all, only half-heartedly… fosters cynicism and serves to undermine faith in our system of law.
>
> *US attorney Richard Sutherland*[1].

**Abstract:**
Three related themes are briefly discussed: (a) the ethics of ecosystem protection, (b) Australian policy relating to the protection of representative freshwater ecosystems within networks of protected areas, and (c) the need to protect freshwater reserves from cumulative developments within the landscapes in which they sit. I conclude that Australia has strong statutory and policy commitments in these areas *which are not being implemented*. Long-standing implementation failures are probably due largely to weak management within government natural resource management agencies, combined with a lack of political 'voice' from the values at stake. Major freshwater ecosystem values have been, and continue to be, lost – in many cases irretrievably. Urgent action is required in the face of increasing pressures to harvest water resources for human consumption. Climate change provides a disturbing backdrop to these pressing issues. The paper concludes with specific recommendations, largely relating to planning mechanisms for protecting freshwater ecosystems from cumulative impacts within the wider landscape.

**Keywords**: freshwater protected areas, cumulative impacts, land use planning, policy failure.

**The ethics of ecosystem protection:**
In a classic essay "The historical roots of our ecologic crisis" Lynn White (1967) argues that modern technology and its application, the immediate cause for the twentieth century's environmental problems, emerged from an anthropocentric culture of thought which rests in large part on Judaism. The particular passage cited is the 'dominion' passage of the Book of Genesis 1:26,28):

> Then God said "Let us make man in our image, in our likeness, and let them rule over the fish of the sea and the birds of the air, over the livestock, over all the earth, and over all the creatures that move along the ground". So God created man in his own image, in the image of God he created him: male and female he created them. God blessed them and said to them, "Be fruitful and increase in number; fill the earth and subdue it. Rule over the fish of the sea and the birds of the air and over every living creature that moves along the ground."

White's essay continues to create discussion and controversy. Many support his basic contention (eg: McKibben 1989). Christian writers (eg: Birch 1993, Hill 2000) inheriting in part a Judaic foundation, have argued for the expansion of Christian philosophy to encompass strong environmental stewardship ethics. However, such arguments appear to have limited sway over the bulk of the Christian churches or their leaders. Consider, for example, the Christian 'Cornwall Declaration on Environmental Stewardship' 2000, which criticises

"*unfounded and undue concerns [including] fears of destructive manmade global warming, overpopulation, and rampant species loss*". The evidence suggests that these three issues are in fact three of the most important facing the immediate future of our planet (MEA 2005, Novacek & Cleland 2001). It is also noticeable that modern Buddhist leaders, in spite of the inherent environmental concepts within their philosophy, do not speak strongly for comprehensive environmental stewardship (see for example The Dalai Lama 1995 and other works by the same author). For a detailed discussion of various religious positions on the environment, see Nash (1990).

Henry James Thoreau, John Muir and Aldo Leopold (referred to by Callicott 2003 as "the three giants of American environmental philosophy) all advocated a reverence for nature, and argued the need to set aside large areas away from human impact (wilderness areas) in order to preserve intrinsic natural values.

The National Strategy for the Conservation of Australia's Biological Diversity (Commonwealth of Australia 1996:2) contains an important paragraph:

> *There is in the community a view that the conservation of biological diversity also has an ethical basis. We share the earth with many other life forms which warrant our respect, whether or not they are of benefit to us. Earth belongs to the future as well as the present; no single species or generation can claim it as its own.*

While this document, and thus this paragraph, was endorsed by all three levels of Australian government, the views expressed here, as vital as they are, receive virtually no public discussion. They are, moreover, entirely absent from the paradigms which appear to underpin government policy.

The planet's biodiversity is in decline, and freshwater ecosystems are in urgent need of protection. The creation of freshwater protected areas is usually justified in terms of utilitarian needs relating to the conservation of biodiversity or the protection and enhancement of recreational and amenity values. Could such reserves also be justified in terms of ethics? In spite of the general absence of discussion of ethics within areas of freshwater science or ecosystem management, a substantial and long-standing literature exists from which an ethical basis for the establishment of protected areas could be drawn. Far from harvesting other life forms in a sustainable way, humans are gradually but inexorably killing the wild living inhabitants of our planet, and destroying the places in which they live.

The time to adopt a new ethical position has already passed with some talk but almost no action. *We need to accord a right to 'peaceful coexistence' to at least a fair proportion of the other living residents of the planet* – an approach which in fact aligns with the scientific recommendations of many conservation biologists. The matter is now so urgent that it requires the attention of every freshwater scientist and manager.

**Representative networks of freshwater protected areas:**
According to the *Convention on Biological Diversity 1992,* the conservation of biodiversity, including aquatic biodiversity, requires the protection of representative examples of all major ecosystem types (especially those vulnerable to degradation) coupled with the sympathetic management of ecosystems outside those protected areas. This requirement was re-affirmed by the 2004 World Conservation Congress.

Although the Australian Commonwealth Government, and all eight Australian State and Territory governments are committed to this approach, only Victoria, Tasmania and the Australian Capital Territory have funded specific programs aimed at establishing fully representative systems of inland aquatic protected areas. In Victoria and Tasmania these systems remain incomplete, and progress in implementing long-standing commitments appears to have stalled. Although all Australian jurisdictions have established reserves (Ramsar sites, for example) which protect aquatic ecosystems, the degree to which such reserves protect representative inland aquatic ecosystems has not been systematically assessed in any Australian State

The world's first legislation establishing a national system for river protection was the USA's *Wild and Scenic Rivers Act 1968*, and since that time many USA States have passed mirror legislation – with 172 rivers or river reaches now receiving statutory protection. In 1984 Canada, one of the worlds wettest countries, created a system to protect the nation's most important rivers – the Canadian Heritage Rivers System (www.chrs.ca). Twenty-two years later 40 rivers (or river reaches) have been protected under this system, which is now so popular that nominations over the last several years have been driven solely by community pressure. The situation in Australia, one of the world's driest countries, is quite different. Here most of the policy initiatives aimed at the protection of biodiversity through the creation of strategic freshwater (here meaning 'inland aquatic') protected area networks have been only partially implemented, after long delays. In almost every case, where freshwater protected areas exist outside major national parks, protection from the degradation within their catchment has been either absent or ineffective.

Several important statutory provisions for the creation of aquatic protected areas remain, after many years, un-used in freshwaters. These issues are discussed in a 270-page report, Nevill & Phillips (2004).

**State and Territory freshwater protected area policy:**
Generally speaking, freshwater protected areas can be established either through:

- special purpose legislation (eg: Victoria's *Heritage Rivers Act 1992*);
- legislation designed primarily for the purposes of creating terrestrial reserves (eg: the Australian Capital Territories' River Reserves, created under the *Land (Planning and Environment) Act 1991*);
- fisheries legislation containing area protection provisions, or
- management plans having authority under a variety of different statutes (eg: the Canadian Heritage River System (CHRS) works primarily through the development of river management plans authorised under various provincial statues. If a similar system was instituted in the Australian context, it could take advantage of area protection provisions within catchment legislation such as Victoria's *Catchment and Land Protection Act 1994*).

Table 1 presents summary information on Australian approaches to the establishment of aquatic protected areas. The Canadian and USA national systems are included by way of comparison, as they represent the two oldest, and arguably the two most successful national river protection frameworks globally.

All Australian States have established protected areas over wetlands. In most cases these reserves have been created using statutes focused on the creation of terrestrial reserves. The statutes authorising the creation of terrestrial reserves are often named by titles such as 'Land Act' or 'National Parks and Wildlife Act'. Table 1 is focused on mechanisms created or used (in part) to protect inland aquatic areas. It includes examples of different approaches that either have been used to protect inland waters (such as the ACT's land-based river reserves), or have been created with a clear intention of protecting inland waters (such as the as yet un-used provisions of Tasmanian fisheries legislation).

Note that Queensland 'fish habitat areas' and New South Wales 'aquatic reserves' have not yet been established in freshwater, although they have been established in estuarine and marine waters (Hankinson & Blanch 2002). Similarly the 'aquatic reserve' provisions of SA's *Fisheries Act 1982* have not yet been used in freshwater, like the equivalent provisions of the Victorian *Fisheries Act 1995*. The Tasmanian 'fauna reserve' provisions have also not been used at this stage in freshwater. The New South Wales 'wild river' provisions *have* been recently used, many years after they were first introduced, and the Queensland Government has (somewhat slowly) nominated five rivers for declaration under the *Wild Rivers Act 2005* (Nevill 2006).

Table 1 includes mention of the 'special area' controls in NSW's *Sydney Water Catchment Act 1998* and Victoria's *Catchment and Land Protection Act 1994*, as well as the 'environmental protection provisions' in the NSW *Water Management Act 2000* (see Chapter 6 and Appendix

4 of Nevill and Phillips (2004)) – all of which could be used to protect discrete freshwater areas, although at this stage they have not yet been utilised for this specific purpose.

International agreements and national policies relating to the protection of biological diversity encourage the protection of critical habitats. The Victorian *Flora and Fauna Guarantee Act 1988* provides powers to designate and protect critical habitat areas that could apply to aquatic ecosystems: however it is noteworthy that these provisions have not yet been applied to protect freshwater areas.

Protected areas are created to protect the values of places and ecosystems, not to protect the areas themselves. There are a number of different techniques which governments can use of encourage the protection of such values. In order to simplify the listing of legislation in Table 1, a few general statutory techniques are coded as follows:

| **Area or buffer *** | **Technique** | **Code** |
|---|---|---|
| Area | Management plan may be prepared, values may be monitored and reported. Activities within the area must comply with the management plan once finalised. | Type A |
| Area | Management plan must be prepared and approved. Plan must seek to protect values. Activities within the area must comply with the management plan once finalised. Type Bii: values must be monitored and reported. | Type Bi<br>Type Bii |
| Buffer | Approvals for developments (including water use) within the buffer may consider likely effects on area values. | Type 1 |
| Buffer | Approvals for developments (including water use) within the buffer must consider likely effects on area values. | Type 2 |
| Buffer | Approvals for developments within the buffer must seek, amongst other objectives, to protect the area values. | Type 3 |
| Buffer | Approvals for developments within the buffer must seek, amongst other objectives, to protect the area values. A precautionary approach must be applied to approvals relating to the cumulative effects of incremental buffer developments. | Type 4 |
| Buffer | Approvals for developments within the buffer must seek, amongst other objectives, to protect the area values. Certain activities likely to prejudice area values are prohibited, subject to strict exemption clauses. | Type 5 |
| Buffer | Approvals for developments within the buffer must conform to an approved catchment plan (or strategic environmental assessment) which seeks to limit the cumulative effects of incremental developments well before the catchment approaches a crisis point, or changes begin to degrade area values. | Type 6 |

* “buffer” as used here means the land outside the boundary of the designated area which directly influences aquatic values within the area. In the case of surface flows this will be the stream catchment; in the case of sub-surface flows this will be the groundwater catchment.

A degree of licence and summary has been used in interpreting statutes in order to extract useful patterns of approach – and prevent the table clogging with detailed legal discussion.

Note that Table 1 does not contain examples of two mechanism types: Type 4 and Type 6. Type 4 is included as it is represented by an important example outside the area of land management: the Commonwealth *Fisheries Management Act 1991,* which, like catchment management controls, confronts difficult issues of the control of the cumulative effects of incremental development. The precautionary approach of the fishery model could well be applied to land management, and in fact the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, through its emphasis on the precautionary approach, provides a lead in this direction. Type 6 is included as this approach is strongly recommended by Nevill (2003) in a paper discussing the management of cumulative effects within catchments.

**Table 1. (short version) Administrative models for establishing aquatic protected areas:**

*A comparison of protected values and protection mechanisms; note that the existence of a statutory control mechanism does not imply is has been used.*

| | Enabling Act | Scope | | | | Public / private land may be declared | Area (reserve) controls are available. | Catchment landuse (buffer) controls are available | Water use controls (extraction, dams etc) are available |
|---|---|---|---|---|---|---|---|---|---|
| | | biodiversity protected | geodiversity protected | recreational, landscape protected | historic, cultural, spiritual | | | | |
| USA Wild and Scenic Rivers | Wild and Scenic Rivers Act 1968 | Yes ('fish and wildlife') | Yes | Yes | Yes | Both | Type Bi | Type 3 ("immediate environments"). | Type 3 – protect "free flowing condition". |
| Canadian Heritage River Sys. | No specific enabling legislation | Yes | Yes | Yes | Yes | Both | Type Bii | Type 3, under management plans. | Type 5, no dams. |
| ACT river reserves | Land (Planning & Environment) Act 1991 | Yes | Yes | Yes | Yes, historic, cultural | Public (no freehold land in the ACT). | Type Bi | Type 2 | Type 2 |
| Western Australian reserves | Land Administration Act 1997 | Yes | Protect 'natural' values. | Yes. | Yes | Public | Type A | Type 1 | Type 1 |
| SA aquatic reserves | Fisheries Act 1982 | Yes | No | No | No | Public | Type Bi | Type 1 | Type 1 |
| NSW 'special area' controls | Sydney Water Catchment Management Act 1998 | Yes – s.44 "ecological integrity" protected. | No | No | No | Public | Type Bi. | Type 1 | Type 3 |
| NSW Aquatic Reserves | Fisheries Management Act 1994 | Yes | No | Recreation only | No | Both | Type Bi | Type 2 | Type 1 |
| NSW Wild Rivers | National Parks and Wildlife Act 1974 | No guidance | No guidance | No guidance | No guidance | Public | Wild Rivers are already within protected areas. | Type 2. | Type 2. |

**Table 1. (continued) (short version) Administrative models for establishing aquatic protected areas:**

| | Enabling Act | Scope | | | | Public / private land may be declared | Area (reserve) controls are available. | Catchment landuse (buffer) controls are available | Water use controls (extraction, dams etc) are available |
|---|---|---|---|---|---|---|---|---|---|
| | | biodiversity protected | geodiversity protected | recreational, landscape protected | historic, cultural, spiritual | | | | |
| NSW env protection (zone) provisions | Water Management Act 2000 | Oblique - see s.34. | No | No | No | Both | Type Bi | Type 1 | Type 2 |
| Queensland fish habitat areas. | Fisheries Act 1994 | Fish habitat protection only | No | No | No | Both | Type A | Type 1 | Type 2 |
| Queensland Wild Rivers | Wild Rivers Act 2005 | Yes; protect natural values | Yes | Yes, implicitly. | No | Both | Type Bi | Type 2 | Type 5 |
| Tasmanian Fauna Reserve | Inland Fisheries Act 1995 | Yes | No | No. | No | Both | Type A | Type 1 | Type 2 |
| Victorian Critical Habitat | Flora & Fauna Guarantee Act 1988 | Yes | No. | No. | No | Both | Type A | Type 2 | Type 2 |
| Victorian Heritage Rivers | Heritage Rivers Act 1992 | Yes | Yes | Recreation only | No | Public | Type Bi | Type 5 | Type 5 |
| Victorian Fisheries Reserves | Fisheries Act 1995 | Yes | No | Passive recreation only | No | Both | Type Bi | Type 1 | Type 1 |
| Victorian 'special area' controls | Catchment and Land Protection Act 1994. | Yes – s.27 protect aquatic habitat. | No | Protect the "quality and condition" of the land | No | Both | Type Bi. | Type 1 | Type 3 |

**Table 1. (extended version) Administrative models for establishing aquatic protected areas:**

*A comparison of protected values and protection mechanisms; note that the existence of a statutory control mechanism does not imply it has been used.*

| | Enabling Act | Clear statement of purpose / objective | Scope | | | | Public / private land may be declared | Area (reserve) controls are available. | Catchment landuse (buffer) controls are available | Water use controls (extraction, dams etc) are available |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | biodiversity protected | geodiversity protected | recreational, landscape protected | historic, cultural, spiritual | | | | |
| USA Wild and Scenic Rivers | Wild and Scenic Rivers Act 1968 | Yes, s. 1(b) and 1(c) emphasis protection of free flow. | Yes (fish and wildlife) | Yes | Yes | Yes | Both | Type Bi, mining and dredging may be prohibited. | Type 3 ("immediate environments"). | Type 3 – obligation to protect "free flowing condition". |
| Canadian Heritage River Sys. | No specific enabling legislation | Yes, - protection of river values. | Yes | Yes | Yes | Yes | Both | Type Bii, using various provincial statutes. | Type 3, under management plans. | Type 5, no dams. |
| ACT river reserves | Land (Planning & Environment) Act 1991 | Yes, s. 7 promote ecologically sustainable.. | Yes | Yes | Yes | Yes, historic, cultural | Public (no freehold land in the ACT). | Type Bi | Type 2 | Type 2 |
| Western Australian reserves | Land Administration Act 1997 | Implicit aquatic purpose | Yes | Protect 'natural' values. | Yes. | Yes | Public | Type A | Type 1 | Type 1 |
| SA aquatic reserves | Fisheries Act 1982 | Section 47-s.48: protection of habitat. | Yes | No | No | No | Public | Type Bi – see s.48G. | Type 1 | Type 1 |
| NSW 'special area' controls | Sydney Water Catchment Management Act 1998 | yes – s.44 "protect water quality or ecological integrity" | Yes – s.44 "ecological integrity" protected. | No | No | No | Public | Type Bi. | Type 1 | Type 3 – water extraction may be controlled. |
| NSW Aquatic Reserves | Fisheries Management Act 1994 | Act s.3. - include conserv of biodiversity. | Yes | No | Recreation only | No | Both | Type Bi, mining is prohibited. | Type 2 | Type 1 |
| NSW Wild Rivers | National Parks and Wildlife Act 1974 | No statement as to purpose of WR designation. | No guidance | No guidance | No guidance | No guidance | Public | Designated rivers are already within protected areas. | Type 2. | Type 2. |

**Table 1. (continued) (extended version) Administrative models for establishing aquatic protected areas:**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| NSW env protection (zone) provisions | Water Management Act 2000 | S. 34 "to minimise harm to water sources". | Oblique - see s.34. | No | No | No | Both | Type Bi – minister can veto a development application. | Type 1 | Type 2 |
| Queensland fish habitat areas. | Fisheries Act 1994 | No statement as to purpose of FH area. | Fish habitat protection only | No | No | No | Both | Type A | Type 1 | Type 2 |
| Queensland Wild Rivers | Wild Rivers Act 2005 | Section 5: preserve natural values. | Yes; protect natural values | Yes | Yes, implicitly. | No | Both | Type Bi | Type 2; floodplain and subartesian areas can be defined. | Type 5; declaration can control un-allocated water flow. |
| Tasmanian Fauna Reserve | Inland Fisheries Act 1995 | No statement of objective, but see Act s.154-155. | Yes | No | No. | No | Both | Type A | Type 1 | Type 2 |
| Victorian Critical Habitat | Flora and Fauna Guarantee Act 1988 | Yes, s. 1 "conserve flora and fauna". | Yes | No. | No. | No | Both | Type A | Type 2 | Type 2 |
| Victorian Heritage Rivers | Heritage Rivers Act 1992 | Yes; see Act s.1 and s.7. | Yes | Yes | Recreation only | No | Public | Type Bi; see s.10. | Type 5; see s.10, s.12. | Type 5; obligation to maintain "free flowing state" s.9 |
| Victorian Fisheries Reserves | Fisheries Act 1995 | Yes, s.88. protection of species and habitats. | Yes | No | Passive recreation only | No | Both | Type Bi, see s.89. | Type 1 | Type 1 |
| Victorian 'special area' controls | Catchment and Land Protection Act 1994. | Yes; s.27 – protect land, water, aquifer and habitat quality. | Yes – s.27 protect aquatic habitat. | No | Protect the "quality and condition" of the land | No | Both | Type Bi. | Type 1 | Type 3 – through referred controls. |

Table 1 illustrates that States have taken a variety of different policy approaches to freshwater area protection, using similar procedural 'building blocks'. A protected area system which places a high priority on minimising controls on surrounding land uses, and minimising adverse impacts on future land and water developments in the wider catchment, will favour a Type A area management approach together with buffer controls of Types 1, 2 or 3. On the other hand, utilising a Type Bii area management approach alongside buffer controls of Types 4, 5 or 6 places protection of important biodiversity values as a high priority, signalling a real commitment to biodiversity conservation – providing of course that the system is in fact implemented.

Table 1 indicates that no one model has been favoured across jurisdictions. An obvious question is (even given patchy implementation): "what has been learned from the different approaches, and do some methods work better than others?" This question is outside the scope of the present paper, but it is worth noting that Saunders et al. (2002) in an important review, has addressed this issue in terms of general models for freshwater protected areas. With regard to the Australian scene, Cullen (2002a) extends some of Saunder's concepts, while Cullen (2002b) suggests a national approach to conserving high-value rivers, borrowing some Canadian ideas. Maher et al. (2002) provide a comparative review of State water legislation, and recommend a 'model framework' for water legislation which in part addresses the issue of protected areas. Bennett et al. (2002) make similar, although more general recommendations to guide the conservation of freshwaters. Nevill and Phillips (2004 chapter 7) focussing on river protection, discuss management elements likely to increase the effectiveness of conservation programs. Kingsford et al. (2005) examine Australian management systems, and recommend adoption of elements of the Canadian CHRS model. These seven major papers all stress the perhaps obvious point that the values of freshwater ecosystems cannot be protected without protecting both surface flow regimes and the hydrology and water quality of the wider catchment.

Generally speaking, studies of comparative freshwater conservation programs do suggest certain elements are critical:

- a clear statement of statutory purpose and management objectives, focusing on the protection of (natural and cultural) ecosystem values;
- genuine stakeholder involvement through consultation, monitoring and reporting frameworks dedicated, in part, to promote adaptive management;
- local management autonomy within a strong (and financially supportive) framework of national strategic conservation objectives and priorities;
- obligations (not options) on decision-makers to apply a precautionary approach to the management of the cumulative effects of incremental developments within the catchment;
- controls over both public and private land, with a development approvals process applicable to the wider catchment which *must* seek to protect identified ecosystem values, amongst other planning objectives;
- use of natural resource accounting approaches aimed at measuring and maintaining both the overall value of natural assets, as well as the value of continuing ecosystem services;
- multi-faceted management approaches, with the most important ecosystems largely managed within protected areas, surrounded by controlled buffers, with utilized ecosystems in the wider catchment managed sympathetically – all supported by comprehensive and accessible national freshwater ecosystem inventories.

Table 2 lists specific State commitments to the development of systems of representative freshwater protected areas, and the programs developed to put these commitments in place. More detail on State programs is contained in Nevill and Phillips (2004), particularly Chapter 6 and Appendix 4.

**Table 2. State representative freshwater reserve commitments and programs**

| | Commitment contained in: | Specific implementation program |
|---|---|---|
| **National** | National Strategy for Ecologically Sustainable Development 1992<br>Intergovernmental Agreement on the Environment 1992<br>National Strategy for the Conservation of Australia's Biological Diversity 1996 | *National Reserve System Program*<br>NRS Directions Statement (NRMMC 2005) targets freshwater representation. No strategic representative national framework developed or developing. |
| **ACT** | Nature Conservation Strategy 1998 | *Nature Conservation Program* - effectively complete. |
| **NSW** | Rivers and Estuaries Policy 1992;<br>Wetlands Management Policy 1996;<br>Biodiversity Strategy 1999; | *None.*<br>The State Aquatic Biodiversity Strategy, due for release in 1999, appears to have been postponed indefinitely. |
| **NT** | A Strategy for Conservation of the Biological Diversity of Wetlands, 2000 | *None.*<br>Conservation strategies reviewed 2005, commitments reaffirmed, still no systematic program. |
| **Qld** | Strategy for the conservation and management of Queensland wetlands 1999 | *None,* however a comprehensive State wetland inventory under preparation should enable identification of poorly represented freshwater ecosystems. The wild rivers program, although a separate commitment, seems likely to assist in meeting systematic conservation objectives. |
| **SA** | Wetlands Strategy 2003. The policy has an explicit commitment to representative wetland reserves, set against a wide interpretation of the meaning of 'wetland'. | *None* – however efforts are being made within the Parks program to purchase poorly represented wetland types (Nevill and Phillips 2004). |
| **Tas** | Nature Conservation Strategy (2000)<br>State Water Development Plan 2002,<br>Conservation of Freshwater Ecosystem Values (CFEV) Project (design phase 2002-2004) | State budget 2002 funded the *CFEV project* (see Appendix 10 of Nevill and Phillips 2004). No specific funds allocated for project implementation since 2003, with no published implementation program. |
| **Vic** | A Conservation Strategy for Victoria (CS)1987;<br>Biodiversity strategy 1997a, 1997b, 1997c<br>Healthy Rivers Strategy 2002 | *Heritage Rivers Program*<br>representative wetlands component of the CS incomplete although implementation progressing slowly.<br>*Healthy Rivers Program:* Heritage river management plans remain in draft form without an implementation program. |
| **WA** | Wetlands Conservation Policy 1997.<br>This commitment was not reinforced by the draft Waterways WA Policy 2002 (Nevill and Phillips 2004). | *None*.<br>The Waterways WA Policy, due for publication initially in 2003, has not yet been released. |

All States have programs in place designed to meet commitments under the Ramsar convention - these commitments include the development of freshwater ecosystem inventories, and (in theory although usually not in practice) the establishment of systems of reserves covering the full range of wetlands included in the Ramsar definition of the term. In no State are these programs complete and up-to-date, although work, particularly on ecosystem inventories, continues - with Victorian, Tasmanian and ACT inventories being the most advanced. Approaches used in Queensland are perhaps the most ambitious; however this program, and the also-ambitious NSW program are advancing slowly under present funding arrangements.

The ACT is the only jurisdiction to successfully establish a reasonably comprehensive system of representative freshwater protected areas including both still and flowing ecosystems (Nevill and Phillips 2004). The ACT has had the advantage of being the smallest

Australian jurisdiction, as well as having, historically, the most favourable funding. As discussed above, the ACT, Victoria, and Tasmania are in fact the only jurisdictions to attempt to directly action their "representative freshwater protected area" commitments. The Victorian program, while seemingly ambitious, has not been completed and is currently under review as part of the Healthy Rivers Program, with major commitments dating back more than a decade incomplete (Nevill and Phillips 2004). The Tasmania system is under development, with the inventory phase due for completion at the close of 2006. No specific funds for program implementation were allocated in the 2004/05 or 2005/06 State budgets.

Of the five remaining jurisdictions, Queensland and New South Wales have commenced the construction of State-wide freshwater ecosystem inventories, and South Australia is committed to do so (building on existing regional wetland inventories). In Western Australia and the Northern Territory, action has not been taken to put in place either comprehensive State ecosystem inventories, or State-wide systems of representative freshwater protected areas. Instead, these States have concentrated on the broader bioregional framework of the Commonwealth's National Reserves System Program (NRSP), which itself did not highlight the freshwater reserve issue until 2004 (see discussion in Nevill and Phillips 2004). It is to be hoped that action will be taken within the NRSP to establish a nationally agreed approach to the classification of freshwater ecosystems into categories or types, which could provide a framework for the long-term development of a national system of representative freshwater reserves.

The pervasive failure of Australian governments to implement important policy tools (and other aspects of policy relating to the protection of freshwater ecosystems) raises questions about the real commitment governments have to policies which have no strong political constituencies.

**Cumulative effects within the landscape:**
There are many Acts of Parliament, as well as important strategic policies, that are based on good intentions and sound logic but which fail at the level of implementation. This is particularly the case with respect to attempts to control the cumulative impacts of incremental development occurring over a substantial period of time. Even though a strategy may be put in place to control or prohibit new developments which would (for example) extract additional water from a catchment, it appears to be almost a general rule that the strategy will be subverted by numerous small approval decisions running directly counter to the intent, if not the letter of the strategy (Odum 1982). This tendency is compounded where the costs of resource degradation fall on the community (and future generations) rather than on the individual who benefits from resource exploitation (Hardin 1968).

Finlayson et al. (2008) examined attempts to control the impacts of groundwater extraction and farm dams, making the point that the failure to properly control cumulative impacts is a persistent and widespread problem, with huge ramifications to freshwater ecosystems, including of course those ‘protected’ within designated reserves.

**Groundwater in the Murray-Darling Basin:**
The extended catchment of the Murray-Darling Basin overlaps four of Australia’s States plus the small Australian Capital Territory. In 1995 pressing problems of land and water degradation, and the decline of widespread and important environmental values in the Basin, led only to a cap on river water extraction, even though the importance of the surface water/groundwater connection was evident. Moreover, States have been extremely slow to implement core groundwater reforms added to the *Framework* in 1996. This delay, combined with the failure of States to implement commitments to the precautionary management of natural resources, has magnified the environmental and economic crisis facing the Basin.

Rivers and groundwaters are connected and Evans (2007) has provided a review of the impacts of groundwater extraction on rivers in Australia. When we extract water from a river’s groundwater supply, we diminish that river’s flow – even though the effect may not be noticed for some time. Most Australian rivers feed on groundwater most of the time. Generally speaking, freshwater biologists and river managers underplay the huge significance of groundwater in maintaining the health of rivers, streams and wetlands, with

the result that groundwater policy and management does not get the scrutiny it deserves – and needs.

Waters of many Australian rivers, streams and aquifers had been over-allocated – in some cases grossly over-allocated. In the Basin, total annual water entitlements issued by State water management agencies amounted to 14,680 GL in 1994/95, of which 12,131 GL were actually diverted, compared to the annual Basin river flow of 12,896 GL/yr. In other words, licensed entitlements were 114% of the average available water, while usage ran at 94%. Over 50% of the Basin's average annual runoff (23,850 GL) had been diverted, compared to less than 3% in all but one of Australia's remaining drainage divisions. The median annual river flow at its mouth prior to development is estimated at 11,318 GL, less than the average annual volume diverted for human use. It is not surprising that outflow to the sea has stopped on several occasions in recent years.

Groundwater extraction is often clustered around aquifers underlying river valleys (Fig. 1) demonstrating, at a practical level, the interconnected nature of the resource. The over-allocation of the Basin's waters, and the pressing environmental problems of land degradation, water quality and declining biodiversity values forced the Murray-Darling Basin Ministerial Council and the Murray-Darling Basin Commission to confront the concept of limiting catchment development. Although integrated catchment management had, by this time, been the subject of long-standing discussion, the Council chose only to cap water extraction from rivers. No controls were mooted on the development of irrigated land, harvesting of floodplain water, construction of levee banks and farm dams, draining wetlands, clearance of native vegetation, or extraction of groundwater – all issues of immediate concern to catchments in water crisis. It should be said, however, that all these issues were under discussion within State water agencies. The important point is that the Council was moving slowly, well behind current science and community concern – in spite of the urgency of the issues.

The Council introduced an interim cap in 1995 and a permanent cap on the diversion of water from the Basin's river system from 1 July 1997. The two primary objectives driving the decision to implement the Cap were:

- to maintain and, where appropriate, improve existing flow regimes in the waterways of the Murray-Darling Basin to protect and enhance the riverine environment; and
- to achieve sustainable consumptive use by developing and managing Basin water resources to meet ecological, commercial and social needs.

The cap was defined as: *"The volume of [river] water that would have been diverted under 1993/94 levels of development."* The cap, as a result, fluctuates from year to year, depending mostly on climate. In practice, the total cap varies above and below roughly 11,000 GL/yr. In February 1994 CoAG adopted "a strategic framework for the reform of the Australian water industry" – to become known as the Water Reform Framework. The Framework had two central elements: *economic reform* to increase competition and efficiency within the industry, and *environmental reform* to increase emphasis on sustainable use of natural resources, and protection of environmental (especially biodiversity) values.

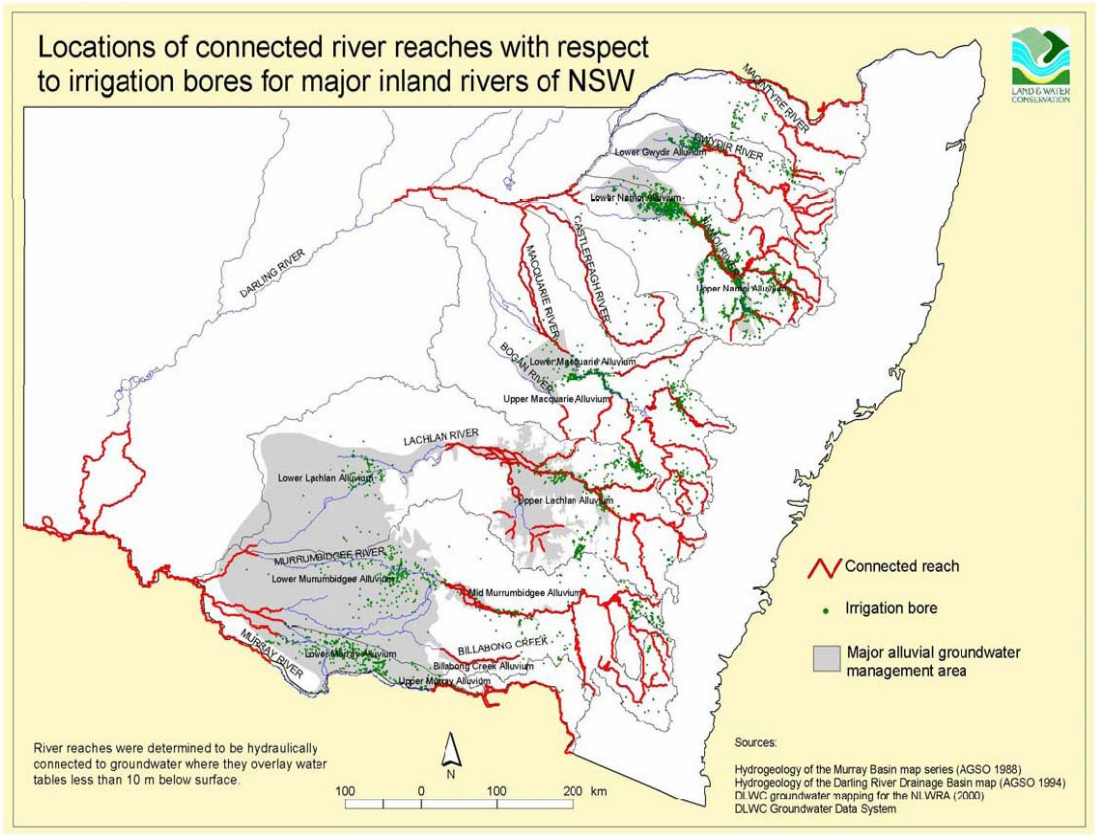


**Figure 1 NSW river reaches and groundwater management areas. Source: SKM (2006:103), from NSW Department of Land and Water Conservation data.**

The Framework was to evolve over the following decade, through agreements reached both within and subsequent to CoAG meetings. Of immediate interest are the amendments summarised in a letter from the Prime Minister to State Premiers and Chief Ministers of 10 February 1997. The governments agreed to specific additions then referred to as the 1996 CoAG water reform framework, including agreements focused on groundwater:

- to integrate groundwater and surface water resource management;
- to develop a nationally consistent definition and approach to calculating sustainable groundwater yield;
- to prepare groundwater management plans, policies and strategies;
- to base groundwater allocations on groundwater management plans;
- to ensure that such plans included environmental water provisions in accordance with agreed principles; and
- to address and retrieve over-allocation issues on a plan-by-plan basis.

Commitments at this level should have prompted rapid implementation action in a Commission committed to “take a visionary approach, provide leadership, and be prepared to make difficult decisions” (quoted from the Commission’s mission statement).

While the cap on river water diversions has been, overall, a limited success, full compliance with the cap has not yet been achieved. After more than a decade, procedures allowing a full audit of cap compliance are still to be finalised. Queensland in particular delayed compliance measures while rapidly expanding water allocations. In an examination of the lower Balonne catchment (Queensland), Dr Poh-Ling Tan (now at Griffith University) found evidence indicating that in the years immediately following the interim cap, the Queensland State Government maintained a casual attitude to increasing floodplain water harvesting, allowed catchment farm dams to increase by 90%, and licensed a 50% increase in diversions. The

total capacity of off-stream dams in the Lower Balonne increased from 247 GL in 1994 to 827 GL in 1999. Even the most recent cap audit report draws attention to the lack of agreed measures for assessing Queensland compliance with the cap, more than a decade after the cap was first imposed.

Dr Tan also drew attention to other important issues which have pervaded water management in all Australian States: a cavalier attitude on the part of State Government water agencies to both procedure and accountability, political influence on bestowing water allocations, and issues of pervasive non-compliance (on the part of irrigators) with extraction licence conditions. All these have undermined effective management of catchment cumulative impacts across the nation (Nevill 2007a).

Over-allocations have been reduced during the last decade, however the reductions have been slow, and have not been adequate to provide the environmental flows the river needs. Total surface and groundwater usage for 2004/05 is still around 9,300 GL compared with the river's natural median flow of 11,300 GL/yr. If total surface water entitlements for 2004/05 (at about 11,000 GL) are added to total groundwater entitlements (see below) they sum to around 14,000 GL/yr, still a lot more than the river's natural annual average flow at the Murray's mouth of around 13,000 GL/yr. *The waters of the Basin remain grossly over-allocated for human use, and the Basin's environments continue to suffer.*

Around 2000, the Commission's groundwater consultants recommended that the cap on river extraction should be extended to groundwater – a basic commonsense approach which should have been implemented earlier. But where was the response? Where indeed was the response on the part of State water management agencies to their long-standing CoAG commitments?

In 2004, the Commission published a report by their Groundwater Technical Reference Group (GTRG): *Estimated impact of groundwater use on streamflow in the Murray-Darling Basin*. According to the GTRG:

- "Each jurisdiction has legislation and policy that allows for the integrated management of surface water and groundwater, but implementation of the integrated approach has not occurred to-date.
- The intended outcomes of the Cap on surface water diversions have been compromised as a result of the increased groundwater use since 1993/94.
- The jurisdictions have identified technical and planning investigations that will be undertaken and investigations that are needed to reduce uncertainty, although the implementation plan for these investigations has not been made clear."

A later report by Land and Water Australia (LWA 2007) stated:

- Australia has no agreed method for assessing the sustainable yield of groundwater.

In other words, *after nearly a decade, no effective action had been taken, either by the Commission or by State agencies to implement core CoAG policy* (see the Prime Minister's letter referenced above). These policy elements are essential for the management of cumulative effects across the Basin, and fundamental to any management program aimed at sustainable use of groundwater. This inaction was, evidently, not restricted to the Basin, but appears as a major failure across the whole of Australia (Nevill 2007b).

Two of the most important commitments State Governments have made relating to groundwater management are: (a) the development of water accounts and allocation plans using an aquifer water balance approach – taking account of surface water linkages, and (b) the supply of environmental water allocations to groundwater dependent ecosystems in accordance with agreed principles. The results of a survey in late 2007 indicated that, more than a decade after all States made firm policy commitments, most Australian jurisdictions have made little or no progress towards meeting these goals (Nevill 2008).

**Cumulative impacts of farm dams:**
Tony Ladson, from Monash University, has reviewed the impact of farms dams (Finlayson et al. 2008) – this discussion is taken from his analysis. One small farm dam will make virtually no difference to the streamflow at a catchment outlet, but the cumulative effect of a large number of farm dams can have a dramatic impact. CSIRO, in their review of risks to River Murray flows, showed that by 2020 if farm dams volumes continue to increase by 48% per 10-years as they have over the last decade, then flows could be reduced by 3000 GL or 13% by 2020 (van Dijk, 2006). This impact would be greater than all the other risks to water resources they assessed: climate change, bushfires, afforestation, groundwater extraction and irrigation water management.

Farm dams catch water that would otherwise runoff. The effectiveness of each ML of dam storage in reducing streamflows depends on climate (rainfall and evaporation) and water use – irrigation or stock and domestic consumption. In dry areas (rainfall < 870 mm/year), where farm dams matter most, 1 ML of storage will reduce flows by about 1 ML per year (Lowe et al. 2005). Farm dam densities are typically 4.6 ML/km$^2$ in Victoria (median value) with 22% of catchments exceeding 10 ML/km$^2$ (Lowe et al. 2005). There are similar farm dam densities in the Murray-Darling Basin. Densities greater than 10 ML/km$^2$ are reported in the Namoi/Peel, Kiewa, Goulburn-Broken and South-Australian catchments while, typically, densities are 1-10 ML/km$^2$ in the Lachlan, Murrumbidgee, Macquarie/Castlereagh, Upper Murray, and Wimmera catchments. The total volume of farm dams in Victoria is about 870 GL while for the Murray-Darling Basin the value is about 2,200 GL. For comparison, the volume of Victorian farm dams is nearly 3 times the storage volume of the major Eppalock Dam and those in the Murray-Darling Basin are equal to twice the storage volume of the Burrinjuck Dam in NSW.

Multiplying the number of farm dams by their impact gives the overall flow reduction. For example, on average, farm dams reduce streamflows by around 4.5 ML/km$^2$ across Victoria or about 730 GL/year (Lowe et al. 2005; Nathan et al. 2005). Flow reduction caused by farm dams in the Murray-Darling Basin is about 1900 GL/year (van Dijk, 2006).

The impact on streamflows is greatest in catchments with the least runoff; those that have low rainfall and high evaporation. Stream gauge information for Victoria shows that mean annual runoff in low rainfall catchments is typically 40-80 ML/km$^2$ (Nathan and Weinmann, 1993). Therefore, flow reductions in these catchments are 5% to 10% of mean annual runoff if farm dam densities are at average levels. Catchments where farm dams are known to have a major impact on flows include the Marne River in South Australia (mean annual runoff 29 ML/km$^2$), Yass River in NSW (53 ML/km$^2$) and Broadwater Creek in Queensland (55 ML/km$^2$) (Yu et al., 2002; Neal et al., 2002). In extreme cases, for example Mitchell Creek in the Onkaparinga Catchment in South Australia, median flows are reduced by 20% by farm dams but low flows (90$^{th}$ exceedence percentile) are reduced by 99%. Overall, in impacted streams, dry spells occur more often, last longer, and occur later in the summer season than they would naturally.

The volume of farm dam storage in the Murray-Darling Basin is increasing by about 4% per year i.e. doubling every 17.5 years and there are few controls on this development. Victoria has the most effective legislation yet 90% of farm dams are unlicensed (representing 88% of dam volume) (AWRa 2005). In most areas of Australia the number and volume of farm dams is unknown (or unreported) and licensing laws are lax.

Controlling farm dams runs up against property rights. Who should own the rain that falls on private land? Sections of the community in Victoria were strongly opposed to the licensing of farm dams and the fact that water held in dams, to be used for commercial or irrigation purposes, had to be purchased from existing licence holders. A Victorian politician gave voice to concerns held by many farmers:

> "…it appears that the review committee intends that commercial and industrial users of rainwater should be charged for the rainwater that falls on their properties and is stored in dams. This is of massive concern to the agricultural producers, dairy farmers and other people I have mentioned. It goes back to a longstanding tradition

in our community. As I understand it, rainwater belongs to the people upon whom the rain falls." (Bowden 2001).

Controlling farm dams is going to require politicians to stare down these types of objections. So far, in most of Australia, there has been little done to fix the problem. In the Australian Water Resources Assessment 2000 (NLWRA 2001) the treatment of farm dams was noted as an information gap because their impact on catchment yield was not considered. In the 2005 Water Resources Assessment (AWR 2005) it was found that farm dams were still not accounted for in most water management plans. In Queensland the extraction and storage of water into farm dams is not included in the surface water cap for six of the capped water resources plan areas and in South Australia and Victoria no entitlements are required for farm dams constructed for stock and domestic use (AWR 2005b).

There is also an interaction between a drying climate and the influence of farms. Farm dam construction increases in response to drought and if climate change results in reduced rainfall and increasing evaporation this will provide an imperative for farmers to build dams. But these dams will spend more of their time empty (because the climate is dryer) so there will be storage space available to catch more of the runoff when it does occur decreasing flows downstream (van Dijk, 2006). Even with stable climate there is an 'arms race' effect with each new dam decreasing the security of supply from existing dams so encouraging more dams to be constructed, or existing dams to be enlarged, to compensate. The influence of farm dams is an example of the tyranny of small decisions and the tragedy of the commons writ large.

**Concluding remarks:**
All Australian States are committed to the establishment of representative freshwater protected areas. However, in most cases, no systematic approach to their establishment has been attempted, or where it has been attempted (e.g. Victoria and Tasmania) in both cases State Government discontinued funding before the program's goals could be achieved.

The failure of the Victorian government to implement its Heritage River program is of considerable concern, and needs detailed investigation, especially given Victoria's "leading" position with respect to policy development. It appears that no (or very little) action has been taken to finalise and implement the 18 draft heritage river management plans, prepared about a decade ago. It is noteworthy that none of the Heritage Rivers would (in a strict sense) meet the definition of 'protected area' discussed above, as no agreed management plans exist and no monitoring of heritage river values has been reported[2]. The draft management plans need to be re-examined in detail, and the current condition of the sites checked against any available historic data on condition and value. The results of such an investigation may show that no ecosystem deterioration has occurred, or they may indicate substantial deterioration. Such deterioration, if it has occurred, may be related to actions listed in the as-yet unimplemented management plans. Until the issue is independently examined, no clear conclusion can be drawn.

As a matter of urgency, cumulative effects within the water resource industry must be taken much more seriously. Catchments containing freshwater protected areas need the most urgent attention. *Catchment management programs must include at least five critical elements:*

- the need to manage cumulative effects through the establishment of strategic development caps on a catchment basis must be *formally recognised in water resource legislation and in NRM and local government planning processes*, and appropriate procedures must be established to set and implement the caps in consultation with stakeholders. Caps here includes all forms of water abstraction in a catchment, whether by irrigators, urban systems, farm dams or trees;
- *caps must be comprehensive and inclusive*; stakeholder consultation programs must establish caps covering: water extraction from both surface and groundwater, the construction of farm dams (number and volume), agricultural drains, impediments to fish passage, and levee banks, the development of intensive irrigation and agroforestry, the

clearance of deep-rooted vegetation, and activities (eg: stock access) capable of degrading riparian vegetation essential to the health of river ecosystems;

- *adaptive management* principles must be rigorously incorporated within catchment planning processes (noting these form a part of Commonwealth NRM guidelines and bilateral agreements);
- the caps on development *must be set well ahead of the point where the catchment enters a stressed or crisis situation*; and
- last but not least, the caps must be set in a *precautionary* way, entailing a reversal of the burden of proof (Preston 2006).

Plans to protect catchment ecosystems cannot be effective without adequate knowledge of the relative value and the current condition of these ecosystems. There is an urgent need to develop comprehensive State inventories of inland aquatic ecosystems, incorporating both value and condition data well as critical dependencies on ground and surface water flows. Such inventories are slowly developing across Australia, but could benefit greatly by the development of a national framework supported by Commonwealth funding. Moves towards this end are again moving far too slowly.

While the actual reasons for pervasive policy failure in the freshwater area may well be complex, there can be little doubt as to the ultimate outcome. Freshwater ecosystems, particularly those in the southern part of the Australian continent (where agricultural and urban demands for water are substantial) are degrading (National Land and Water Resources Audit 2002a,b), and this degradation will continue in the absence of well-managed reserve systems protecting viable examples of the full range of freshwater ecosystems, as well as provisions to protect ecological processes and biodiversity at catchment scales.

Finally, there are many acts of parliament, regulations and policies that contain principles and protective mechanisms that, *if translated into practice*, would go a long way towards protecting freshwater ecosystems within the wider landscape. Lawyers drafting Australian statutes have often shown great vision… some of the world's best natural resource management statues and policies have been developed in Australia. We need to use them, and use them now.

**Acknowledgements:**
Tony Ladson, Brian Finlayson, Janet Stein, Richard Kingsford.

**References:**
To come .

[1] Rick Sutherland was an environmental attorney and head of the Sierra Club Legal Defense Fund. Quoted in Chasan (2000).
[2] (refer Department of Sustainability and Environment annual reports and website – www.dse.vic.gov.au).