

National Groundwater Committee

Issue Paper 2

Improved Management and Protection of Groundwater Dependent Ecosystems.

The Problem

There is increasing recognition of the partial or total dependence of certain ecosystems on groundwater, and that past management arrangements have made inadequate provisions for the supply of water to maintain priority ecosystems.

COAG water reforms require that environmental water requirements need to be taken into account when assessing the sustainability of water resource development.

Ecosystems dependent or partially dependent on groundwater would include:

- Ecosystems based on vegetation that draws directly on groundwater;
- Ecosystems with some dependence on base flow to streams;
- Aquifer and cave ecosystems;
- Groundwater dependent wetlands; and
- Estuarine and marine ecosystems where there is a substantial groundwater input.

Although there has been significant progress in identifying potential dependence at state level, there is still considerable difficulty in quantitatively defining the level and importance of dependence. “Dependence” is generally considered to be proportional to the fraction of the annual water budget made up by groundwater.

The major challenge for management of groundwater dependent ecosystems is in providing quantitative criteria on which to base protection of priority ecosystems. In this respect, there is little knowledge of indicators of ecosystem stress that would allow adaptive management of groundwater to protect priority systems and no guidance on what impacts are acceptable, although this would depend on the perceived value of the ecosystem. Indeed, there are no accepted ways of valuing ecosystems, and no obvious way of determining costs of loss of ecosystem function.

There is a general consensus that in Australia there is a need for a national (generic) approach or at least coordination of approaches, to define methodology and critical factors and processes which are needed to develop a better understanding of groundwater-dependent ecosystems and of how to manage these better. It is recognised that within the Australian federation, there is a commonality of objectives towards this end, but a diversity of approaches. Any generic approach should examine this diversity and learn from it.

Background

There has been considerable discussion on “environmental flows” to maintain riverine or other surface water ecosystems, but there has been little debate on the requirements for maintenance of groundwater-dependent ecosystems. In the case of aquifer ecosystems (cave ecosystems and stygofauna generally)

there is a virtual absence of information on the nature and extent of such communities, and no guidance at all on methods for their investigation.

Most jurisdictions are estimating likely environmental water requirements in the groundwater and surface water allocation processes, but because of uncertainties in degree of dependence on groundwater, these may be, at best, informed guesses. However it must be recognised that groundwater resources with a low level of utilisation may not require extensive (expensive) investigations as a basis for the determination of environmental provisions.

There are a number of issues that have arisen which are relevant to our understanding of the complexities of groundwater and ecosystem behaviour and their investigation and management. These broadly relate to:

- Difficulties in assessing the qualitative extent of dependence of ecosystems on groundwater where there may be additional stresses on the system
- Difficulties in establishing a systems approach due to the multi-disciplinary nature to such studies
- Significant uncertainties in assigning quantitative criteria to dependence of ecosystems on groundwater, given the difficulties in scaling up from well investigated small areas to ecosystem-scale, system heterogeneities and non-linearity of system response to change, which makes extrapolation and interpolation difficult
- Uncertainties in the flexibility available to management as changes in ecosystems are not necessarily reversible

And in the case of aquifer (stygofaunal) ecosystems, and those associated with cave (karstic) systems:

- A significant lack of information on the distribution and importance of (particularly) subterranean fauna, specifically stygofauna which live in groundwater, but a growing recognition that these are of significant value in terms of uniqueness, identification as rare and endangered species and their general biodiversity.
- No standardized procedures and guidance for resource managers on assessment and investigation of subsurface communities of stygofauna, indeed the basic research which would underpin these still needs to be done.

Policy and Management Directions

It is clear that in the past surface water and groundwater have been managed separately, and there is a clear need to provide policies which use a whole-of-resource approach, involving both surface water and groundwater, and by inference, ecosystems associated with these and at the interface between these. Although some progress has been made in developing policy frameworks, for example in helping to define those GDE's which are of recognised value and at greatest risk, it is difficult given the low level of knowledge (eg. see DLWC, 2002).

There is recognition that there is a need for a strong community involvement in both policy and management. Thus in some states, ecosystem value is determined jointly by government and community groups in specific areas using a consultative and adaptive approach. In some circumstances there could be support for imposing conservative constraints to development within sensitive areas, given the low level of knowledge, and following a "precautionary" approach. In other cases,

international agreements (eg RAMSAR wetland protection, endangered species protection) would help direct policy.

There are a number of non-specific management tools that can be used for protection of GDEs, often identified within groundwater management plans, water allocation plans and other planning instruments. Management tools which are being used include:

- I. risk assessment procedures, use of proclaimed areas,
- II. use of buffer zones for maintenance of both groundwater quantity (levels) and quality,
- III. use of water level distance limits (eg from a stream receiving groundwater baseflow, or wetland),
- IV. exclusion zones and license conditions that restrict extraction at critical times.

All of the above would seem to have provided a situation where there is an overemphasis on groundwater volume, groundwater levels and surface water flows at the expense of water quality. Water quality is in most cases seen as an issue relating more to environmental protection, and consequently this has been managed under environmental regulations rather than under water legislation. The requirement to better integrate quantity and quality management is still an issue of some concern.

Questions that arise from a management perspective include:

- Which GDEs are important and how can we assess level of importance?
- How can systems at risk be identified?
- Are there definable indicators of environmental stress?
- How can ecosystems be valued?
- How can we qualitatively describe and quantify system behaviour and processes?
- Can representative systems be investigated to answer the above, to facilitate transferability of site-specific results to a range of similar situations?
- What innovative tools can be developed and used to manage ecosystems in a way that allows maximum consumptive use of the resource while meeting agreed environmental needs?

The Way Forward

It is proposed that a national set of principles dealing with the allocation of water to groundwater dependent ecosystems be developed drawing on those already developed by a number of jurisdiction (Western Australia WRC 1999,2000; New South Wales DLWC 2000) and to have these agreed by all jurisdictions through the Natural Resource Management Ministerial Council process. The National Groundwater Committee is playing a lead role in facilitating the development of these principles. A national workshop involving members of the National Groundwater Committee, officials from each of the jurisdictions and other interested stakeholders is planned for mid 2003.

References Cited

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