



# Groundwater Management Information Fact Sheet 3: Groundwater Dependent Ecosystems

This fact sheet is one of five fact sheets developed from the information contained in the Sydney Coastal Councils Group *Groundwater Management – A Guide for Local Government*. For further information about the other facts sheets of the Sydney Coastal Councils Group please visit [www.sydneycoastalcouncils.com.au](http://www.sydneycoastalcouncils.com.au)

## What is a Groundwater Dependent Ecosystem

Groundwater dependent ecosystems (GDEs) are a vital yet poorly understood component of the natural environment and can include a variety of both terrestrial and aquatic communities including plants, animals or other organisms. Groundwater carries a range of dissolved nutrients and organic matter that is often essential to these ecosystems. These ecosystems are threatened by human pressures such as the extraction of groundwater and changes in land use or management.

## Types of Groundwater Dependent Ecosystem

Groundwater Dependent Ecosystems are classified into the following categories:

**Terrestrial vegetation:** Forests and woodlands often develop a permanent or seasonal dependence on groundwater, by extending their roots into the water table.

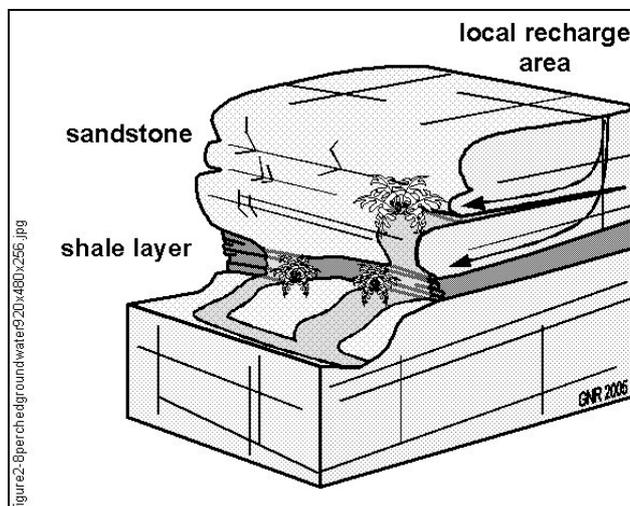
**Base flow in streams:** The saturated base of a river or stream can afford a supply of water even after that in the surface channel has ceased to flow. Exchanges between surface water and groundwater (base flow) occur within a part of the river bed known as the 'hyporheic zone'.

**Aquifer and cave systems:** The typical example of this category is the karst or limestone caves found in the central west areas of the state. Other, less obvious species that are dependent on groundwater include micro-organisms and minute invertebrates that exist within the saturated pore spaces of an aquifer ('hypogean' ecosystems).

**Wetlands:** These include lowland and upland wetlands and hanging swamps. Many wetlands have developed in areas that were originally waterlogged due to the discharge of groundwater at the land surface, and have therefore progressively become reliant on continuing seepage.

**Estuarine and near-shore marine ecosystems:** Various coastal aquatic ecosystems are included in this category, with the most apparent being mangroves and seagrasses. Evidence suggests many seagrass environments are heavily reliant on the nutrients and other constituents transported by groundwater, together with the lower salinity discharge generated from that source.

**Terrestrial fauna:** The species assemblage reliant on groundwater dependent vegetation includes fauna that rely on the habitat formed by the plant communities. In places where critical habitat depends on groundwater for survival, the faunal assemblage associated with those environments would be impacted should any change in water supply occur to the plant community.



**Figure 1:** Groundwater Dependent Ecosystems occur at discharge points (springs) along open fractures or above impermeable layers



**Figure 2:** Eve Street Wetlands. A Groundwater Dependent Ecosystem in the Rockdale LGA, Sydney

If the availability of groundwater is reduced by drought or over-use, or changes in water quality, an aquifer deteriorates and it is likely that the above dependent ecosystems will come under threat. These ecosystems may include species, communities and populations recognised under the *Threatened Species Conservation Act 1995*, the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* or even the *Fisheries Management Act 1995*. These legislative instruments require that Councils, developers and community groups consider threatened species, communities and populations when developments are proposed.

### **Desktop assessment of Groundwater Dependent Ecosystems**

The NSW Government has published a rapid assessment methodology for identifying and attributing a value to Groundwater Dependent Ecosystems (NSW Government 2002), based on the work conducted by the Nature Conservation Council of NSW. The methodology comprises eight steps as follows:

- **Identify geographical area.** The area defined in this step can relate to an aquifer or parts thereof, or may be linked to the development of a planning instrument (i.e. the area might be delineated by an LGA or suburb boundary).
- **List GDEs present.** Ecosystems known, or considered likely, to occur in the defined area are listed. These are tabulated according to location, type of GDE, and type of groundwater system. Any information gaps should also be recorded at this stage.
- **Assess the vulnerability of GDEs.** Each ecosystem is to be assessed based on its vulnerability to quantity depletion (i.e. over extraction), quality impacts (i.e. contamination) and other threatening factors. The degree of dependence on groundwater is to be assessed, and the nature of that dependency is to be recorded (e.g. seasonal, permanent, and opportunistic).
- **Assess the value of the ecosystems.** Factors such as the ecological values of biodiversity and species assemblages should be considered. The social and economic values of the groundwater system for water supply, as a recreational or tourism component, its cultural importance or its worth in maintaining local amenity are also to be considered. Priorities for action can then be decided.
- **List management tools to be used.** Regulatory and non-regulatory tools should be identified that can be applied to the protection of the GDEs. These might include risk assessments, land use restrictions or applying special conditions to bore licences.
- **Prioritise management actions.** Cost-benefit analyses should be undertaken to establish the most effective management tools and options to protect the GDEs identified in the area.
- **Implement management actions.**
- **Review process and outcomes.**

### **Conclusion**

In conclusion, groundwater dependant ecosystems are poorly understood and are an essential part of the natural environment which is under increasing pressure from human activities. These activities can change the structure, function and/or composition of the ecosystem or even completely eliminate sensitive species, therefore a number of recommendations are made in order for councils to successfully comply with their statutory obligations towards Ecological Sustainable Development.

### **Recommendations**

Based on the information contained in this fact sheet and the *Groundwater Management – A Guide for Local Government*, the SCCG recommends that:

- Councils adopt the Groundwater Dependent Ecosystem rapid assessment methodology as a requirement for proposed development in the vicinity of environmentally sensitive areas, including aquifers of high groundwater vulnerability.
- Councils confirm or update the range of listed threatened species under the Threatened Species Conservation Act 1995, the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 or the Fisheries Management Act 1995.
- Councils require that developers give greater consideration to the state groundwater policy documents (particularly the *NSW State Groundwater Dependent Ecosystems Policy*) when proposing a development so as to improve the level of information provided to Councils and state agencies for assessment.

For more information on groundwater management please see the other fact sheets in the series. All fact sheets are available at [www.sydneycoastalcouncils.com.au](http://www.sydneycoastalcouncils.com.au)

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