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WATER RESOURCES IN AUSTRALIA

A summary of the National Land and Water Resources Audit's
Australian Water Resources Assessment 2000

Surface water and groundwater — availability and quality

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NATIONAL LAND AND WATER RESOURCES AUDIT

Assessing the condition and capacity of Australia's natural resources

The National Land and Water Resources Audit (Audit) is conducting the first Australia-wide assessments of:

- water availability and quality
- dryland salinity
- native vegetation
- rangelands monitoring
- agricultural productivity and sustainability
- capacity for improved natural resources management
- catchments, rivers and estuaries
- biodiversity

Australian water resources are scarce and in demand by agricultural, industrial and urban users. Australian Water Resources Assessment 2000 highlights:

- where water resources are
- water quality
- water use
- competing demands for use
- the information needed to improve water resource management

It is the first time that the Commonwealth, States and Territories have collaborated on such a broad program.

PROVIDING ACCESS TO INFORMATION

Australian Natural Resources Atlas

The Australian Natural Resources Atlas (Atlas) is an internet-based 'one-stop-shop' for information on Australia's natural resources. The Atlas provides information and maps at national, State and regional scales; the Australian Water Resources Assessment 2000 report; and the component State and Territory reports.



www.nlwra.gov.au/atlas





Australia: sometimes parched ...

WATER IN A DRY LAND

Australia is a dry continent—rainfall is distributed unevenly and very little (12%) runs off to collect in rivers. The rest evaporates; is taken up by plants; or is held in lakes, wetlands and aquifers. Australia's erratic climate, with its droughts and floods, means river flow is variable.

Defining Australia's water resources

Australian Water Resources Assessment 2000 groups Australia's water resources into surface water and groundwater.

Surface water is divided into:

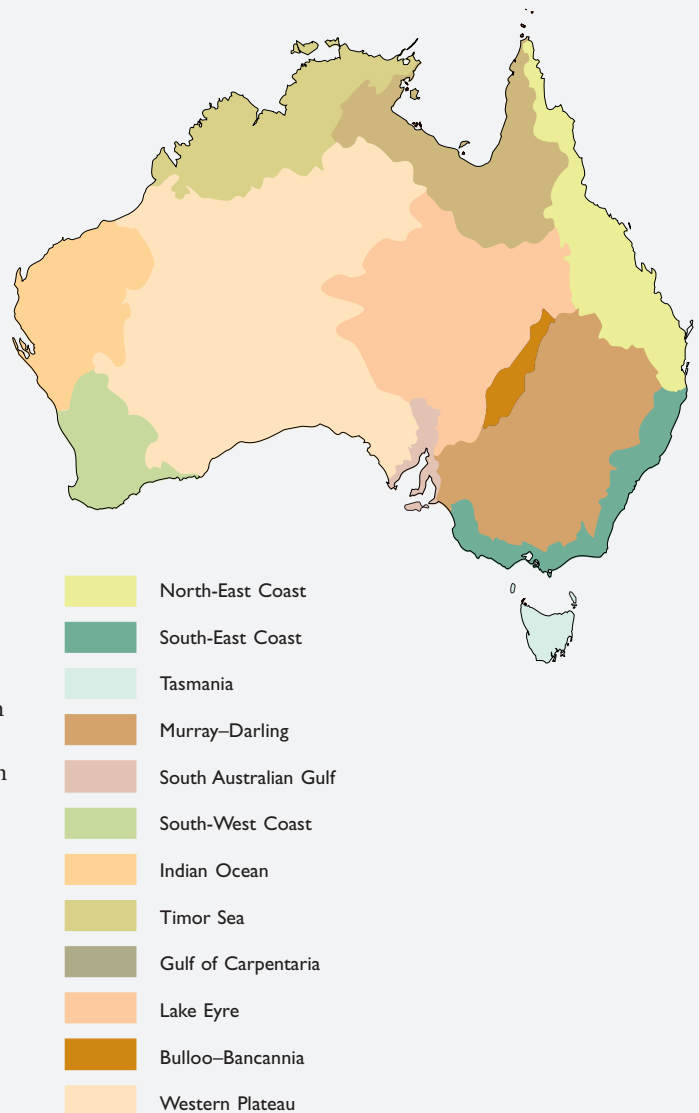
- 12 drainage divisions
- 246 component river basins
- 325 surface water management areas

Groundwater is divided into

- 69 groundwater provinces
- 538 groundwater management units

This is the first time Australia has a spatially defined set of groundwater management units. In some cases, groundwater management areas overlie each other, as groundwater can be found in layers (known as aquifers).

Figure 1. Surface water drainage divisions.



... sometimes wet



Water quality and land use are linked

SURFACE WATER QUALITY

Australian Water Resources Assessment 2000 describes surface water quality using:

- nutrients—nitrogen and phosphorus concentrations
- salinity—salt concentration
- turbidity—‘dirtiness’, generally proportional to the concentration of sediment

The assessment is based on State and Territory water quality guidelines that take account of the natural condition of Australia’s surface water, the surrounding land uses and management objectives for waterways.

The following classification was used:

- **major issue:** water quality guidelines were exceeded in more than 33% of the river basin
- **significant issue:** water quality guidelines were exceeded in more than 5%, but less than 33% of the river basin
- **undetermined issue:** monitoring coverage was less than 50% of the river basin, and observed guidelines were exceeded in less than 5% of the basin
- **not-significant issue:** monitoring coverage was greater than 50% of the river basin and guidelines were exceeded in less than 5% of the basin

Information on other water quality measures—pH and faecal coliforms (bacteria from human and animal waste)—is also provided in the Australian Water Resources Assessment 2000 report. Toxic chemicals, algal blooms and heavy metals were not part of this assessment.

Key findings

Water quality data are limited: there are only sufficient data to assess water quality status for about 30% of Australia’s 246 river basins.

Using State or Territory water quality guidelines as the benchmark:

- nutrients are a major water quality issue in 43 river basins
- salinity is a major water quality issue in 24 river basins
- turbidity is a major water quality issue in 41 river basins

Water quality issues are linked: most river basins that exceed nutrient water quality guidelines also exceed turbidity guidelines since nutrients are transported into rivers by soil particles. Land use management that minimises soil erosion will not only reduce turbidity but also the level of excess nutrients in Australia’s rivers.

Improved land use practice and re-establishment of riparian native vegetation are the keys to improving surface water quality.

Table I. Key findings of the assessment of water quality.

	Number of basins with major water quality issues	Number of basins with significant water quality issues	Number of basins assessed
Nitrogen: total	19	19	50
Phosphorus: total	40	20	75
Salinity	24	18	74
Turbidity	41	10	67



Algal blooms: linked to nutrients

NUTRIENTS: NITROGEN AND PHOSPHORUS

Nutrients are a major water quality issue in 43 (61%) of the 70 assessed river basins

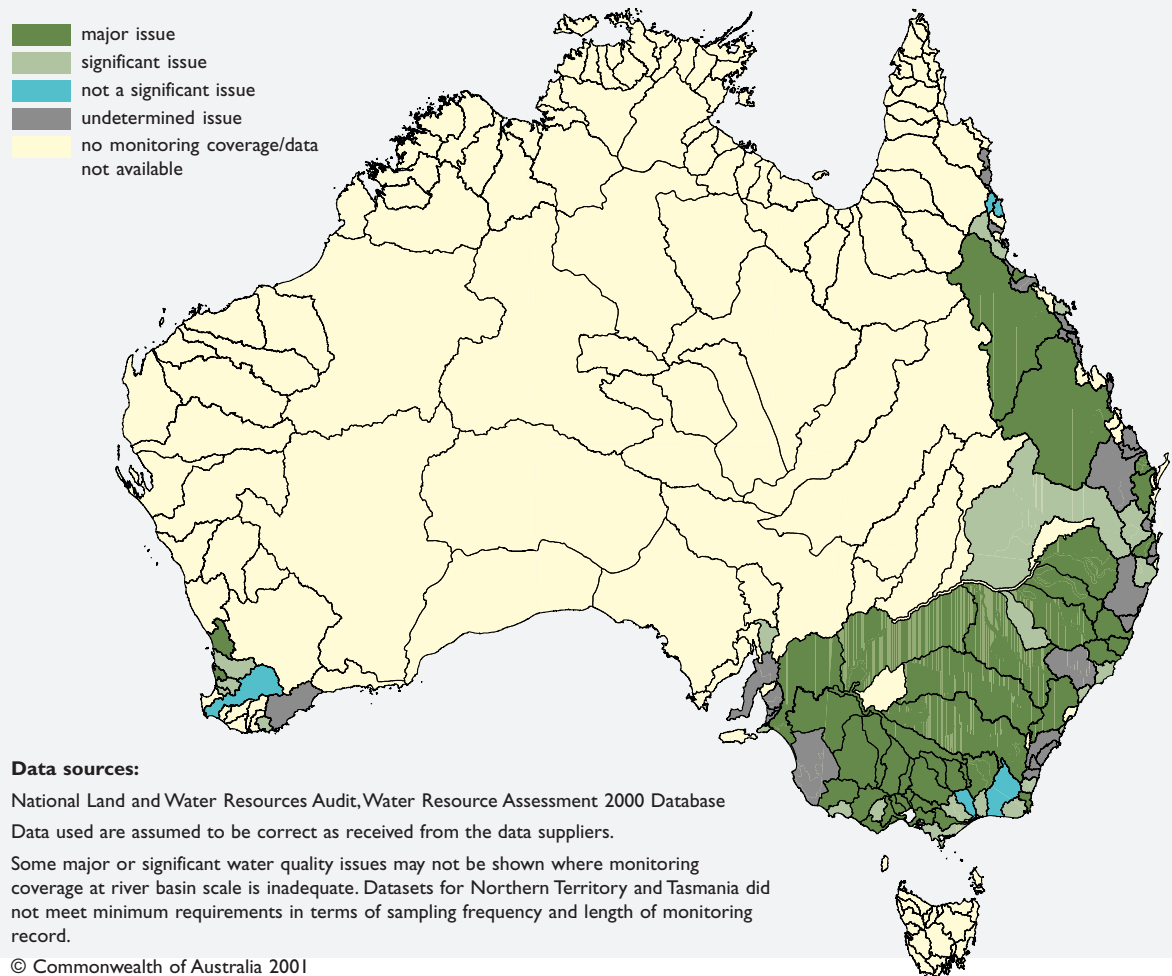
Australia's wide range of soil, vegetation and climate types affect the natural nutrient levels in water. State and Territory water quality guidelines take account of this natural variation, as well as the pattern of land use within a catchment and water values requiring protection.

This assessment shows that nutrients are a major water quality issue, particularly in the more intensively developed river basins in the North-

East Coast, Murray–Darling, South-East Coast, and South-West Coast Drainage Divisions.

Rivers basins assessed to have nutrient levels within the water quality guidelines generally have more extensive vegetation cover and are less intensively developed. These include river basins in north Queensland, north-eastern Victoria and south-western Western Australia.

Figure 2. Surface water quality 2000. Exceedance of nutrient guidelines. Nutrient exceedances are based on total nitrogen and/or total phosphorus values.





Dryland salinity: a source of salt

SALINITY – SURFACE WATER AND GROUNDWATER

Salinity is a major water quality issue in 24 (32%) of 74 assessed river basins

Australia's weathered landscapes and soils, some surface waters and many groundwater resources are naturally salty. River salinity is exacerbated by dryland salinity which mobilises salt stored in the soil.

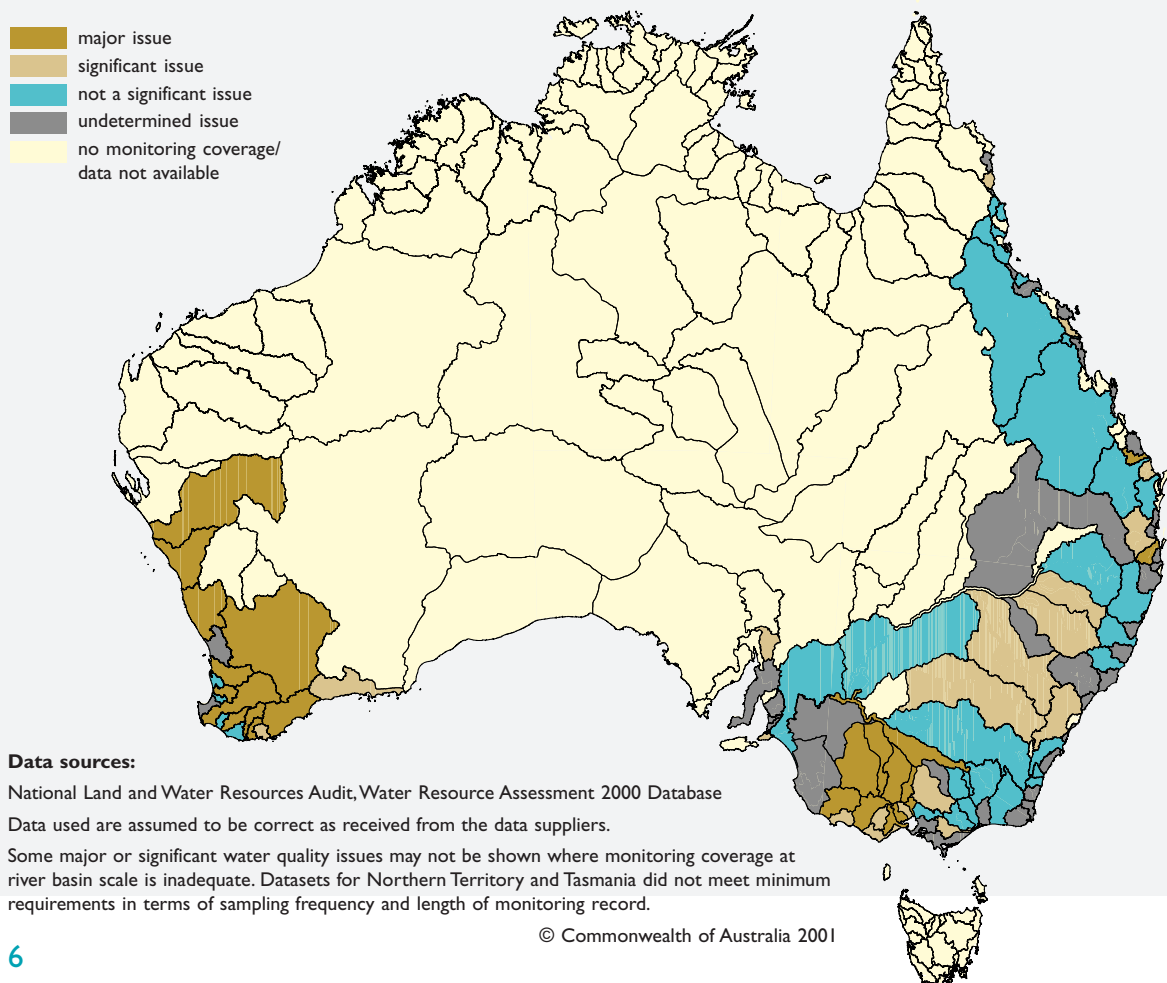
Water Resources Assessment 2000 reveals salinity is a significant water quality issue across southern Australia, affecting river basins in most of the South-West Coast, the southern South-East Coast and southern Murray–Darling Drainage Divisions.

Salinity in surface waters refers to salt concentration and should not be confused with total salt load. Stream flow rates determine loads, so river basins can export high salt loads but not exceed surface water salinity guidelines.

Ground water salinity

Water quality data for groundwater are limited. Many are naturally salty. A review of the salinity status of groundwater reveals that approximately 21 000 GL (72%) of Australia's groundwater resource is suitable for drinking water.

Figure 3. Surface water quality 2000. Exceedance of salinity guidelines.





Turbidity: sometimes naturally high

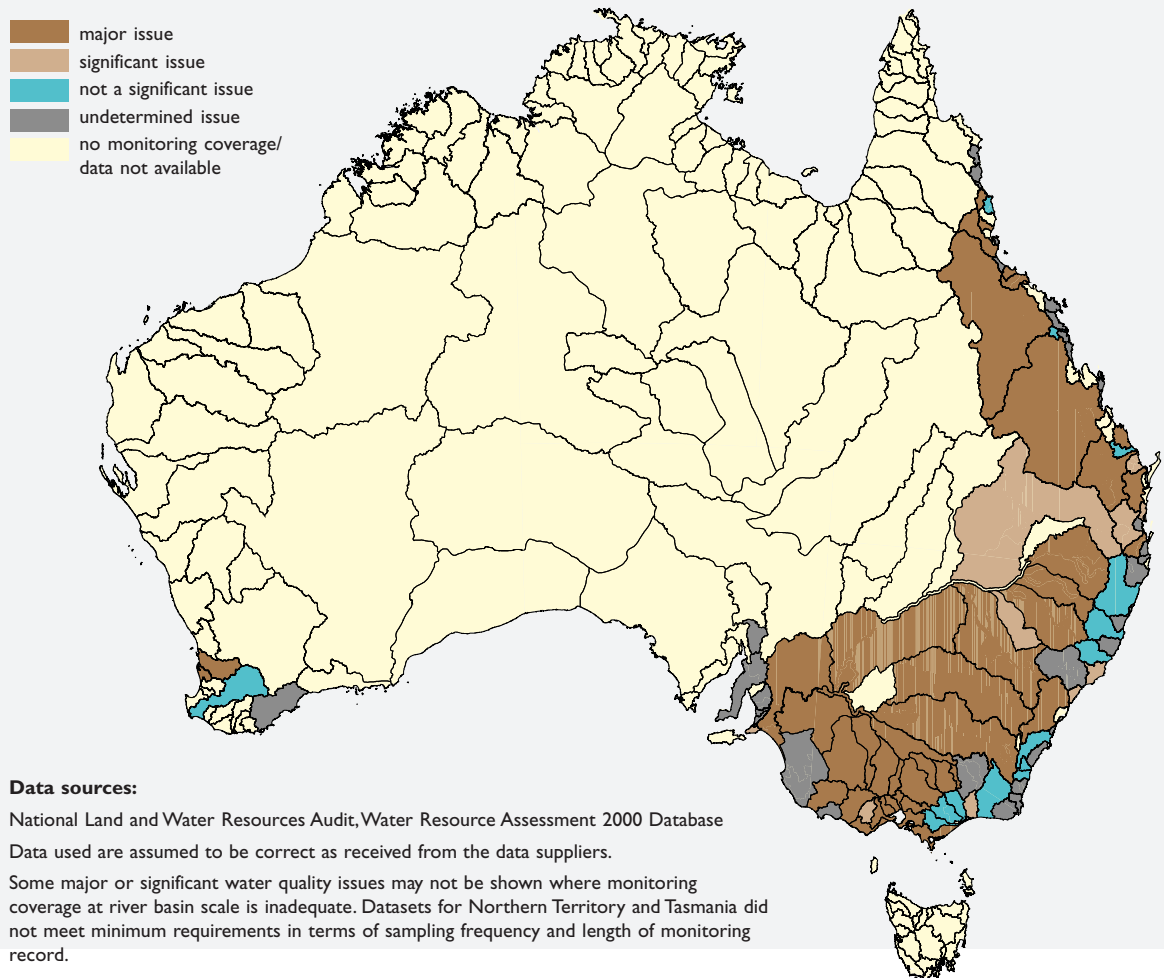
TURBIDITY

Turbidity is a major water quality issue in 41 (61%) of the 67 assessed river basins

Australia's variable rainfall and stream flow and highly erodible soils combine to create many naturally turbid rivers. State and Territory water quality guidelines take account of this natural variation, as well as local land use patterns and the values for which the river basins are managed.

Exceedance of surface water guidelines for turbidity is widespread across Australia. The affected areas include most inland and lower rainfall river basins in the North-East Coast and Murray–Darling Drainage Divisions, and the more intensively developed river basins in the southern South-East Coast Drainage Division. Turbidity was not an issue in relatively well forested, less developed and higher rainfall coastal basins.

Figure 4. Surface water quality 2000. Exceedance of turbidity guidelines.



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Irrigation: Australia's biggest water user

WATER USE AND STORAGE

On a per capita basis, Australia has one of the highest consumptions of water in the world. On average each Australian uses 1.31 million litres each year—a total of 24 000 GL¹ in 1996/97 (or enough water to fill Sydney Harbour 48 times).

Most of this water (19 000 GL) comes from rivers and dams; the rest (5000 GL) is from groundwater.

Irrigated agriculture is the biggest water user (75%). The rest is taken for urban and industrial purposes (20%) and in rural areas for stock and domestic purposes (5%) (see Table 2 below).

In a typical Australian household in 1996/97 each person used around 350 L/day. Half of this was used for gardening, flushing toilets used about a quarter. People in Asia, Africa and Latin America use 50–100 L/day, people in the United States of America use 400–500 L/day.

On average, Australian water use increased by 65% between 1983/84 and 1996/97. This was mostly due to increases in irrigated agriculture. Urban water use per person declined over the 1990s mainly due to an increased awareness of the need to reduce water waste and implementation of water pricing. Industrial use is not large and is falling as industries become more efficient.

Australia stores a lot of water

Australia stores more water than any other country: more than 4 million litres per person (or 12 times the average household consumption).

Water is stored in:

- 447 large dams for urban, irrigation and hydro-electric purposes (79 000 GL)
- several million farm dams (2000 GL).

Australia has about 26 000 GL of groundwater that could be used on a sustainable basis; 72% of this is of adequate quality for stock, domestic purposes and irrigation.

Table 2. Australia's mean annual water use (GL) by category (1996/97).

	Irrigation	Urban/industrial	Rural	Total use ²
New South Wales	8 643	1 060	305	10 008
Victoria	4 451	987	339	5 777
Queensland	2 978	1 052	561	4 591
Western Australia	710	1 027	59	1 796
South Australia	819	292	53	1 164
Tasmania	276	186	9	471
Northern Territory	53	87	39	179
Australian Capital Territory	5	63	4	72
Total	17 935	4 754	1 369	24 058 ³

¹ A GL is a gigalitre, or 1 000 000 000 litres.

² Does not include in situ groundwater use.

³ Not all water use could be assigned to use categories.





WATER USE ACROSS AUSTRALIA

Australian Water Resources Assessment 2000 reports the amount of surface water and groundwater that is used across Australia. The following volumes are in gigalitres and represent average water use during 1996/97. Percent increase in water use is the increase from 1983/84 to 1996/97.

Table 3. Water use across Australia by State.

New South Wales (population: 6 039 000)

	Irrigation (GL)	8 643	Surface water use (GL)	9 000
	Urban/industrial (GL)	1 060	Groundwater use (GL)	1 008
	Rural (GL)	305	Percent increase in water use	60%

Victoria (population: 4 374 000)

	Irrigation (GL)	4 451	Surface water use (GL)	5 166
	Urban/industrial (GL)	987	Groundwater use (GL)	622
	Rural (GL)	339	Percent increase in water use	48%

Queensland (population: 3 369 000)

	Irrigation (GL)	2 978	Surface water use (GL)	2 969
	Urban/industrial (GL)	1 052	Groundwater use (GL)	1 622
	Rural (GL)	561	Percent increase in water use	97%

Western Australia (population: 1 726 000)

	Irrigation (GL)	710	Surface water use (GL)	658
	Urban/industrial (GL)	1 027	Groundwater use (GL)	1 138
	Rural (GL)	59	Percent increase in water use	115%

South Australia (population: 1 428 000)

	Irrigation (GL)	819	Surface water use (GL)	746
	Urban/industrial (GL)	292	Groundwater use (GL)	419
	Rural (GL)	53	Percent increase in water use	12%

Tasmania (population: 460 000)

	Irrigation (GL)	276	Surface water use (GL)	451
	Urban/industrial (GL)	186	Groundwater use (GL)	20
	Rural (GL)	9	Percent increase in water use	171%

Northern Territory (population: 195 000)

	Irrigation (GL)	53	Surface water use (GL)	51
	Urban/industrial (GL)	87	Groundwater use (GL)	128
	Rural (GL)	39	Percent increase in water use	90%

Australian Capital Territory (population: 299 000)

	Irrigation (GL)	5	Surface water use (GL)	68
	Urban/industrial (GL)	63	Groundwater use (GL)	5
	Rural (GL)	4	Percent increase in water use	-



Balancing environmental and other uses

ACHIEVING SUSTAINABLE MANAGEMENT

Water management policies are evolving rapidly and recognise the need to manage systems for environmental values.

Figure 5. Water removed from rivers as a percentage of sustainable flow regimes.

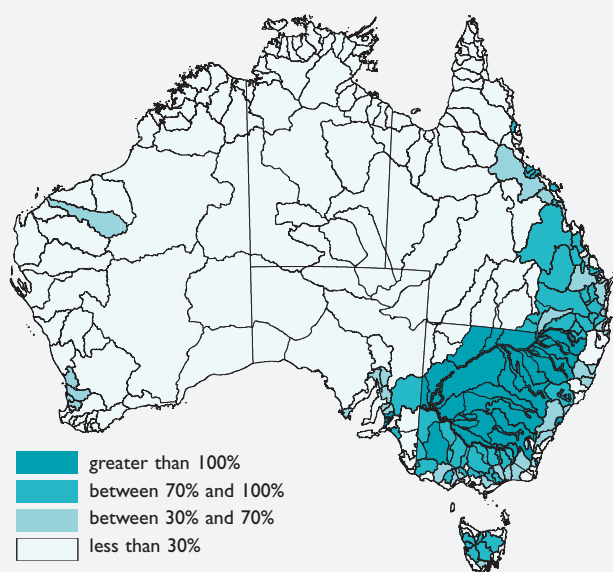
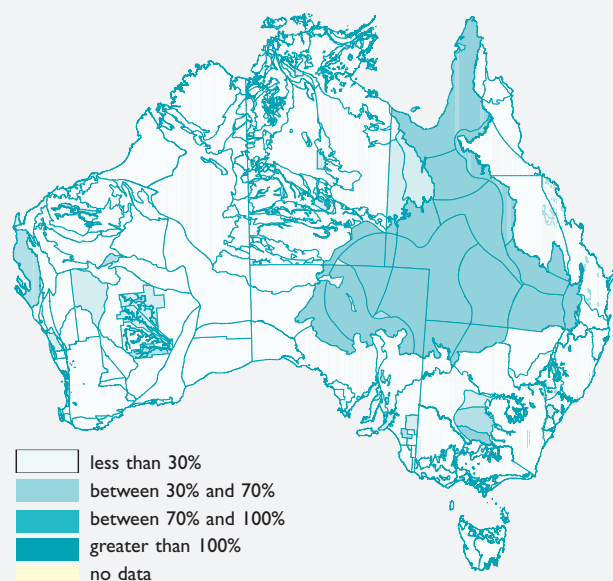


Figure 6. Groundwater abstraction as a percentage of sustainable yield.



The social and economic benefits of developing Australia's water resources have come at a cost to the environment.

Using a definition of sustainable flow and yield (see below) Australian Water Resources Assessment 2000 has classified surface water and groundwater according to water removed versus sustainable use levels.

The assessment reveals:

- 26% of Australia's river basins are approaching or beyond sustainable extraction limits (this accounts for more than half the water used in Australia)
- 34% of Australia's groundwater management units are approaching or beyond sustainable extraction limits

Each State and Territory has different methods to determine sustainable flow regimes (surface water) and sustainable yield (groundwater). In many cases there is a lack of information on ecological requirements.

All States and Territory agencies are undertaking detailed water resource investigations to determine environmental water provisions and development strategies.

Defining sustainability

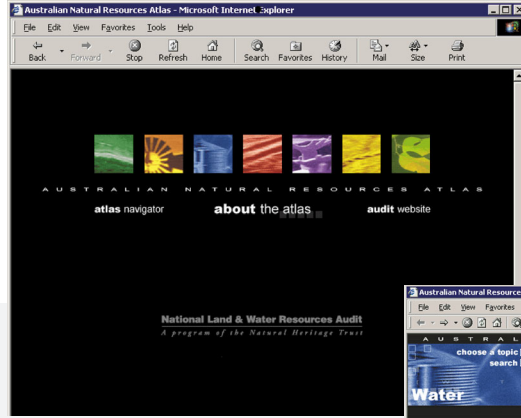
Surface water: sustainable flow regimes

The volume and pattern of water diversions from a river that take account of social, economic and environmental needs.

Groundwater: sustainable yield

The volume of water extraction measured over a specific time frame that should not be exceeded to protect the higher social, environmental and economic uses associated with an aquifer.





PROVIDING ACCESS TO INFORMATION

Access to information is fundamental to managing Australia's water resources. This assessment forms part of the Australian Natural Resources Atlas—an internet-based 'one-stop-shop' for data, maps, information and links to related sites. The Atlas is organised by subject and geography.

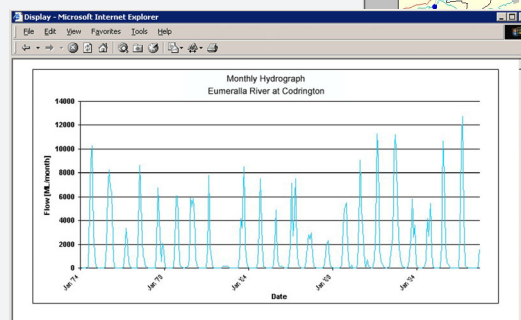
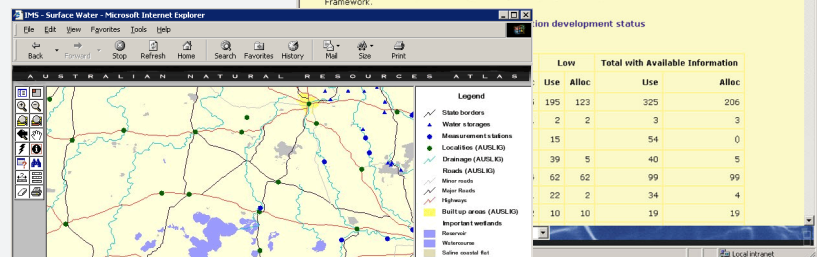
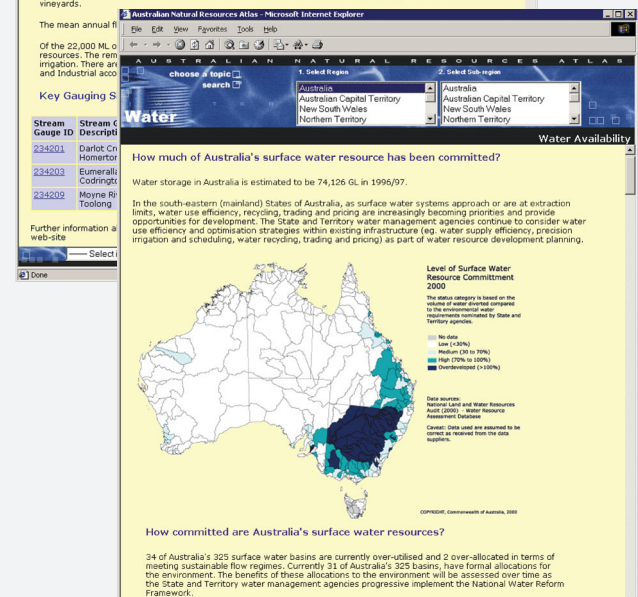
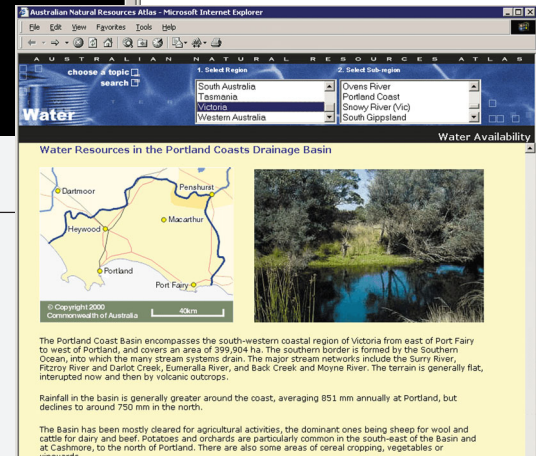
Subjects include:

- coasts
- rangelands
- water—including water availability and quality
- land
- people—Australians and the management of natural resources
- agriculture
- vegetation and biodiversity

Australian Water Resources Assessment 2000 data and information are available in a hierarchy from Australia-wide to drainage divisions to basins to individual stream gauging stations or bore monitoring sites.

Make your own on-line map

The water resources assessment is linked to information collected as part of the other Audit assessments. These data can be combined to produce your own map.



www.nlwra.gov.au/atlas



IN PARTNERSHIP

Australian Water Resources Assessment 2000 was prepared in partnership with State and Territory water management agencies.

New South Wales

Department of Land and Water Conservation www.dlwc.nsw.gov.au

Victoria

Department of Natural Resources & Environment www.nre.vic.gov.au

Queensland

Department of Natural Resources, Queensland www.dnr.qld.gov.au

Western Australia

Water and Rivers Commission www.wrc.wa.gov.au

South Australia

Department of Water Resources www.dwr.sa.gov.au

Tasmania

Department of Primary Industries, Water & Environment www.dpiwe.tas.gov.au

Northern Territory

Department of Lands, Planning & Environment www.lpe.nt.gov.au

Australian Capital Territory

Environment ACT www.act.gov.au/environ

Environment Australia

Australian State of Environment Reporting Unit www.environment.gov.au/soe

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