Natural Heritage Trust

Helping Communities Helping Australia

A Commonwealth Government Initiative

LANDSCAPE HEALTH IN AUSTRALIA

A rapid assessment of the relative condition of Australia's bioregions and subregions

A summary of the National Land and Water Resources Audit's landscape health assessment

www.nlwra.gov.au/atlas

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 & quality
- dryland salinity
- vegetation
- rangelands
- agricultural productivity & sustainability
- Australians in natural resource management
- landscapes, catchments, rivers & estuaries
- biodiversity

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

The Landscape Health assessment is part of the Audit's ecosystem health theme focusing on:

- rivers & estuaries, their catchments, and aquatic ecosystems
- regional landscapes; their recurrent patterns of geology, landform, soil and associated biota

This study indicates the relative significance of issues associated with landscape health and biodiversity status for each subregion of Australia's bioregions. It shows the geographic distribution of these issues, and their relative magnitude, and provides a broad indication of the scale of the challenges Australia faces in maintaining or restoring landscape health.

This study enables these challenges to be broken down into geographic extents that can be used to develop and guide responses.

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 summary information and maps at national, state and regional scales as well as the complete *Landscape Health in Australia* report. Landscape Health information products will available on the Atlas from January 2002.

www.nlwra.gov.au/atlas

DEFINING AND ASSESSING LANDSCAPE HEALTH

Landscape

Landscape is a scale of study and understanding beyond the paddock or the farm. A landscape is characterised by its:

- geology and hydrogeology;
- landforms and soils; and
- plants and animals.

It is important to understand that a particular landscape may be drained by a number of catchments or alternatively a range of landscapes can occur within a single catchment.

Landscape units assessed were the subregions of the 85 IBRA bioregions (Interim Biogeographic Regionalisation of Australia) used by States and Territories for environmental reporting and conservation planning. These subregions are defined on the basis of geomorphic and biogeographic features

Health

Landscape health is assessed by comparing the current state of the landscape against a baseline or reference point. From a biodiversity perspective the pre-settlement landscape represents an appropriate benchmark for measuring landscape health.

How landscape health was assessed

Indicators

- native vegetation
- land use
- soil and hydrology
- weeds
- feral animals
- threatened ecosystems and species

Some useful attributes (e.g. fire regimes) could not be used as indicators due to a lack of suitable data or the difficulty of addressing complex issues in such a short time.

Process

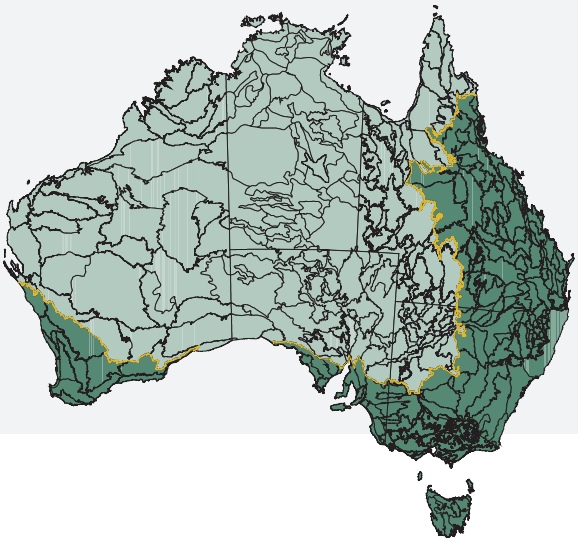
Each indicator was used to assess the status of Australia's 354 subregions.

Subregions were grouped into two discrete zones—the intensive use zone (182 subregions) and the extensive use zone (172 subregions) (Figure 1).

Condition versus trend

The *condition* or state of the subregions was assessed. Where sufficient information was available, *trend* or change in condition could also be measured.

Intensive/extensive use zone boundary



Data source:

National Land and Water Resources Audit, Landscape Health in Australia Database 2001.

Data used are assumed to be correct as received from the data suppliers.

NATIVE VEGETATION

Native vegetation was assessed against four indicators:

- current extent;
- degree of connectivity;
- condition; and
- use.

Current extent

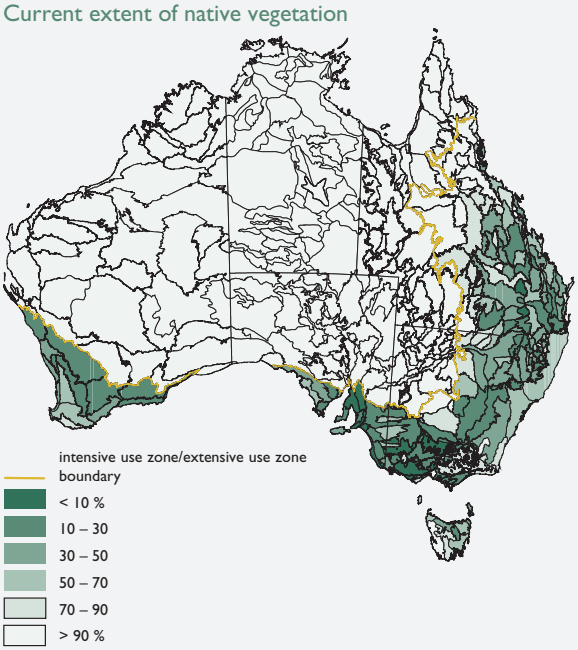
Extent of native vegetation is based on state vegetation coverages which vary in currency and scale. In the intensive use zone, clearing of native vegetation and the accumulated impacts of past clearing continue to be the major cause of impact on landscape health.

CSIRO research has found that loss of wildlife species due to habitat fragmentation begins once clearing exceeds around 20% or 30% of the landscape, and accelerates rapidly when less than 30% of the native vegetation remains.

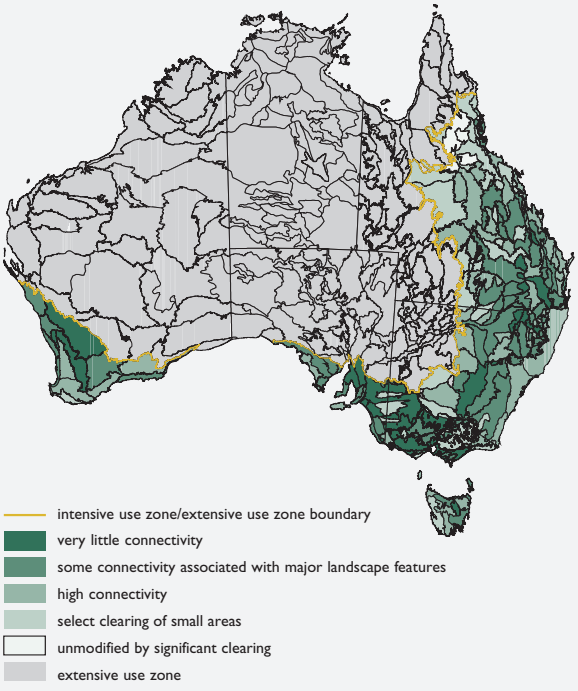
Percentage of original vegetation remaining in each subregion in the intensive use zone.

Less than 50% of original vegetation remaining	Less than 30% of original vegetation remaining	Less than 10% of original vegetation remaining
97 subregions (53%)	57 subregions (31%)	12 subregions (7%)

Current extent of native vegetation



Degree of connectivity of native vegetation



Data source:

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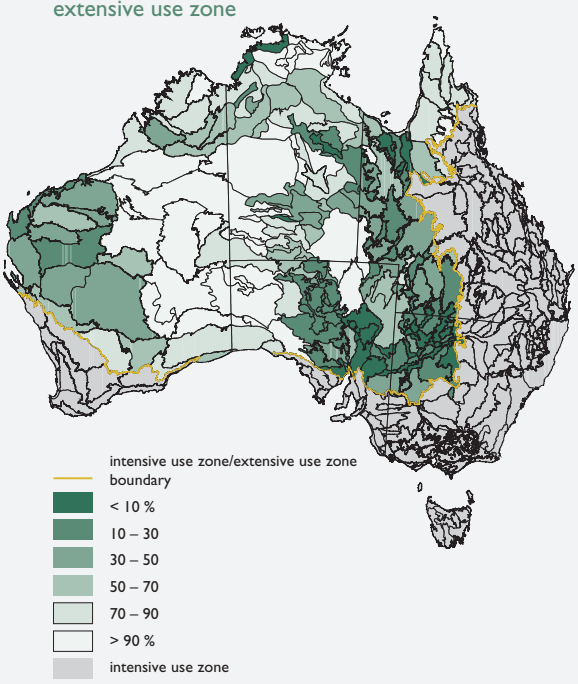
NATIVE VEGETATION

Connectivity

In the intensive land use zone native vegetation often remains as isolated patches surrounded by cleared land rather than continuous vegetation networks. Subregions were allocated to one of five connectivity classes:

- connectivity is broken (Classes 1 & 2) in 88 subregions (48%)
- 49 subregions (27%) have little or no clearing
- 49 subregions (27%) are in the early stages of fragmentation and contain some isolated remnants. These surround the most fragmented subregions and in many cases are subject to continued clearing.

Percentage of subregion with least grazing impact in extensive use zone



Condition

No national or State-wide data sets exist for condition of vegetation. Data used to give an indication of condition were impact of grazing pressure in the extensive land use zone, and land use and conservation reserves.

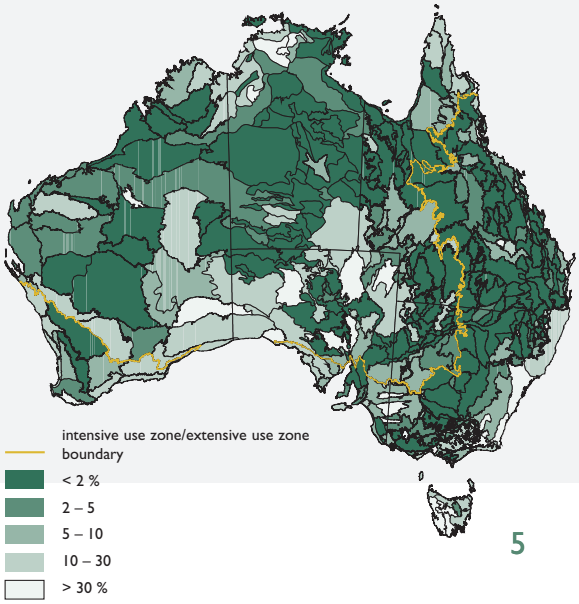
Impact of grazing pressure in the extensive land use zone

- 50 subregions (29%) have more than 70% of their area grazed
- 25 subregions (14%) have more than 90% of their area grazed
- 39 subregions (23%) have little or no grazing

Conservation reserves

- 71 subregions (20%) of the 354 subregions have no protected areas
- 173 subregions (49%) have less than 2% of their area protected
- 63 subregions (18%) have greater than 15% of their area protected
- 30 subregions (8%) have greater than 30% of their area protected

Percentage of subregion in conservation reserves



SOIL AND HYDROLOGY

Dryland salinity

Dryland salinity was mapped using:

- incidence of high water tables and associated high dryland salinity risk (Western Australia, South Australia, New South Wales, Victoria);
- interpretation of dryland salinity hazard based on geology, soils and landforms (Tasmania, Queensland, Northern Territory).

The main areas of high salinity risk or hazard occur in southern temperate Australia—particularly south-west Western Australia, the seaward margins of the Murray Basin in South Australia and parts of central Victoria.

- 10 subregions (4%) have high dryland salinity risk or hazard over more than 10% of their area (mainly south-west Western Australia)
- Dandarragan Plateau north of Perth is the worst affected subregion (41% area)
- four subregions in south-west Western Australia have a high dryland salinity risk or hazard over more than 20% of their area.

Degree of changed hydrological conditions

Hydrology can be changed by:

- soil degradation through over-cultivation or overgrazing;
- land surface changes such as clearing, levelling, replacing or blocking natural drainage lines, contour banking, and building dams or levees.

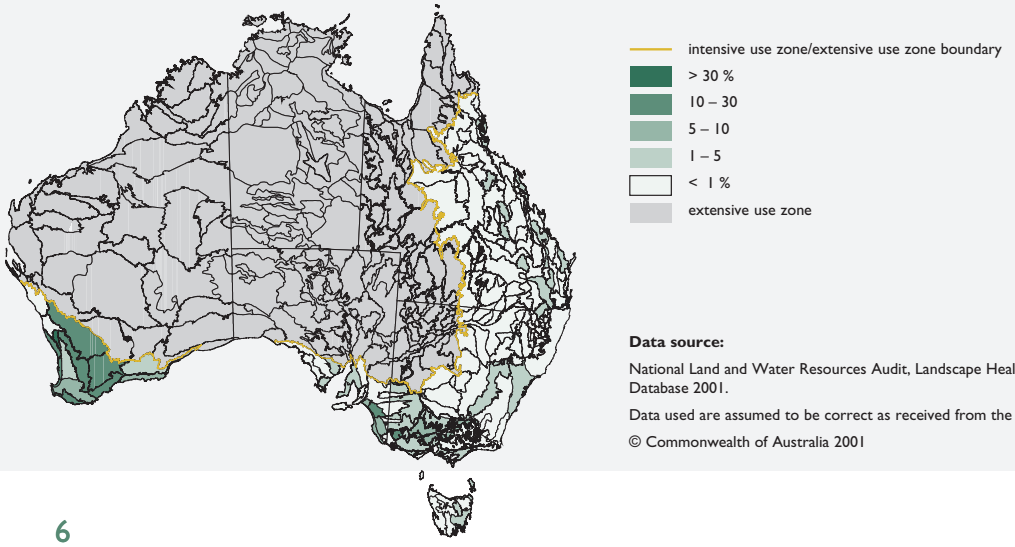
Intensive use zone

- 66 subregions (36%) have moderate to major changes in hydrology mainly due to clearing, disrupted flow paths, or soil degradation

Extensive use zone

- 117 subregions (68%) have little or no changes to their hydrology
- 52 subregions (30%) have minor to moderate changes mainly in the more intensively grazed subregions that have shallow topsoil or soils prone to compacting

Percentage of subregion with high dryland salinity risk or hazard in the intensive use zone



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WEEDS AND FERAL ANIMALS

Weeds

Experts assessed 20 weeds of national significance by density and location. Weeds species could be grouped by current and potential distribution.

Wetland species are generally able to spread to suitable habitats across most of Australia:

- Alligator weed is currently restricted to parts of New South Wales and south-east Queensland. Cabomba occurs between Victoria and north Queensland and is increasing in density and extent. Salvinia is scattered along the northern coast from the Sydney Basin to south-west Western Australia but is not increasing in density due to control efforts.
- In northern Australia, Hymenachne and para grass have invaded natural wetlands in Western Australia, Queensland and the Northern Territory. Pond apple is taking over timbered wetlands in central and northern coastal Queensland.

Species restricted to the north of Australia:

- Herbaceous species include buffel, gamba and mission grass. They are increasing rapidly in extent and density. Woody species are generally increasing in extent and density and include athel pine, mimosa, parkinsonia, prickly acacia and rubber vine.

Species that are mainly restricted to southern Australia:

- Herbaceous species include bridal creeper (invading remnant bushland in south-west Western Australia), serrated tussock and Chilean needle grass (increasing in extent and density in south-eastern Australia) and wards weed (restricted to drier areas and spreading rapidly). Woody weeds are widespread and increasing in extent and density and include bitou bush, blackberry, gorse, boxthorn and willows. Broom, olive and radiata pine are most abundant in South Australia, and increasing in extent and density.

Species with the potential to colonise suitable habitat across the entire continent:

- Lantana occurs along coastal areas in Queensland, New South Wales, Western Australia and Northern Territory and is increasing in extent and density.
- Parthenium is restricted to central Queensland but is continuing to spread.

Feral animals

Assessment of feral animals was based on expert knowledge. Density was classed as occasional, common or abundant.

- Foxes and rabbits have a similar extent across most of southern Australia. Numbers have decreased slightly since introduction of calicivirus.
- Cats occur throughout Australia. Numbers have decreased slightly in the south since the introduction of calicivirus.
- Goats are widespread in south-eastern Australia and central-west Western Australia, but absent from northern, central and central-southern Australia.
- Pigs are widespread in northern and eastern Australia and in south-west Western Australia.
- Buffalo are common and increasing in the far north of the Northern Territory and coast of the Gulf of Carpentaria in north-western Queensland.
- Cane toads extend across north-eastern Australia from northern New South Wales almost to Darwin. They are continuing to expand in range.

THREATENED ECOSYSTEMS AND SPECIES

At-risk ecosystems were only assessed in the intensive use zone since in these areas landscape loss is more easily defined and assessed (using land clearing or cultivation). Land degradation is incremental and less obvious in the extensive use zone. At-risk ecosystems were defined as those:

- where greater than 70% of original extent has been cleared or cultivated
- with an original area of less than 10 000 ha and still being cleared

Proportion(%) of subregional ecosystems at risk.

Ecosystems at risk (%)	Number, percentage of assessed subregions (includes examples)
> 90	12 subregions (7%) · Mount Lofty Ranges (South Australia) · Goldfields (Victoria) · Dawson River Downs (Queensland)
70–90	27 subregions (15%) · Most cropping regions in southern Australia · Northern Midlands (Tasmania) · West Balonne Plains (Queensland)
50–70	58 subregions (32%) · North Coast (New South Wales) · Herbert (Queensland) · Avon Wheatbelt (Western Australia)

Measuring at-risk ecosystems

Ecosystems were generally defined at a scale of 1:100 000 and based on either mapping or expert knowledge.

- 39 subregions (21%) have more than 70% of component ecosystems threatened
- 5 subregions (3%) have almost all (>90%) their ecosystems covering more than 30% of their original extent (includes Wilsons Promontory and Tasmania West)

Threatened species

Threatened species considered were those listed in the *Environment Protection and Biodiversity Conservation act 1999* (Cth). Their occurrence was based on recent sightings and refined by distribution modelling and expert review.

Number of subregions (and percent) in intensive and extensive use zones.

	Intensive	Extensive	Examples
Threatened plants			
> 30 species	38 (11%)		most of south-west Western Australia
10–30 species	86 (47%)	12 (7%)	Broughton, South Australia
no records	3 (2%)	49 (48%)	deserts of northern and north-western Australia
Threatened vertebrate fauna			
>10 species	84 (46%)	12 (7%)	New South Wales North Coast
no threatened species	0	9 (5%)	Burt Plain (Northern Territory)

TREND ATTRIBUTES

Rates of vegetation clearing (1980–1995)

Rates were only assessed for the intensive land use zone.

- Extensive clearing is limited mainly to Queensland, New South Wales, Tasmania and Northern Territory
- South Australia and Victoria have only carried out limited clearing since 1987
- Broad-scale clearing for agriculture essentially ceased during the 1990s in Western Australia

Area of woody native vegetation cleared each year in the intensive use zone 1990–1995, 1995–1997, 1997–1999 (ha/y)

	1990–1995	1995–1997	1997–1999
New South Wales	19 483	*	*
Queensland	280 209	339 662	445 683
South Australia	285	1310	613
Tasmania	4 345	78 316	*
Victoria	8 101	*	*
Western Australia	40 373	*	*
Total	352 798		

* data not available

Trends in dryland salinity

The Audit's national dryland salinity assessment predicted extent of high dryland salinity risk or hazard for 2050. The assessment applies only to the intensive land use zone.

Predicted area of subregion affected by dryland salinity in 2050

- 32 subregions (18%) are expected to have a high risk or hazard of dryland salinity over more than 10% of their area by 2050. Ten subregions (5%) are currently in that condition.
- 13 subregions (7%) are expected to have a high risk or hazard of dryland salinity over more than 30% of their area by 2050. One subregion (0.5%) is currently in that condition.

Predicted area of remnant vegetation affected by dryland salinity in 2050

- 22 subregions will have more than 10% of their native vegetation threatened by high dryland salinity risk, compared with nine at present
- half of these subregions are in south-west Western Australia, 4 occur in South Australia and Victoria, 3 are in New South Wales
- 8 subregions will have greater than 30% of their remaining native vegetation affected by a high risk of dryland salinity. Six of these are in Western Australia; the other two are in South Australia

SYNTHESIS—LANDSCAPE STRESS

A classification of landscape stress was produced for each subregion by using a decision tree that considered the relative importance of each assessed attribute (see below).

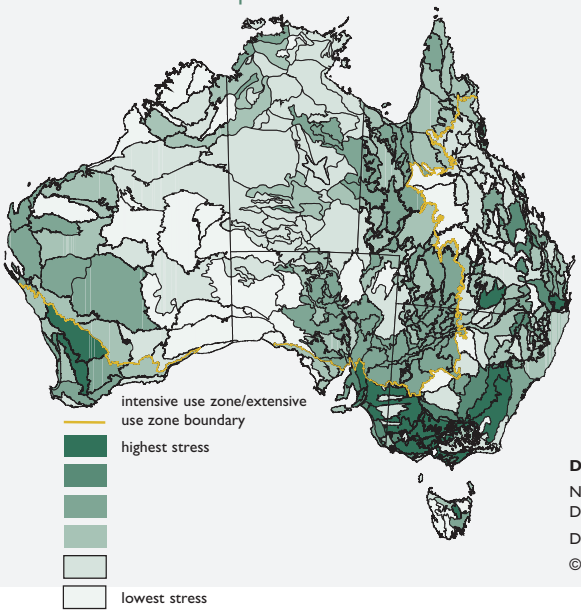
- 37 subregions (10%) fall into the two highest stress classes; they are all in the intensive use zone

Landscape-scale responses are required in these subregions to maximise protection of remaining subregional biodiversity. Priorities include protecting and managing the remaining native vegetation coupled with revegetation strategies that concentrate on restoring or enhancing connectivity and increasing the area of more significant remnants.

- 152 subregions fall into the two lowest stress classes

Subregions within the two lowest stress classes are in relatively good health. These regions are of marginal value to agriculture or pastoralism and provide opportunities for cost-effective and sustainable biodiversity conservation. Clearing is continuing in some of these subregions.

Continental landscape stress



Applications

Specific institutional or on-ground responses are needed to manage and conserve biodiversity in each subregion. These responses can only be determined by more detailed subregional assessments that provide precise estimates of needs and costs of sustaining regional landscape biodiversity in Australia, and clear directions for community and government action. This is the focus of the Audit's biodiversity assessment currently in progress.

The Landscape Health project has provided:

- context and priorities for a closer assessment of subregions; and
- a framework for extrapolation of results across subregions with similar issues or needs.

Attributes used to create the landscape stress rating

Intensive use zone	Extensive use zone
Current extent of native vegetation Connectivity of native vegetation	% subregion with least impact from total grazing pressures
Percent native vegetation in land tenure associated with conservative land use	Percent native vegetation in land tenure associated with conservative land use
Percent of ecosystems threatened	
Percent native vegetation with high risk/hazard of dryland salinity	
Weed number and density	Weed number and density
Feral animal number and density	Feral animal number and density
Number threatened plant and vertebrate fauna species	Number threatened plant and vertebrate fauna species

Data source:

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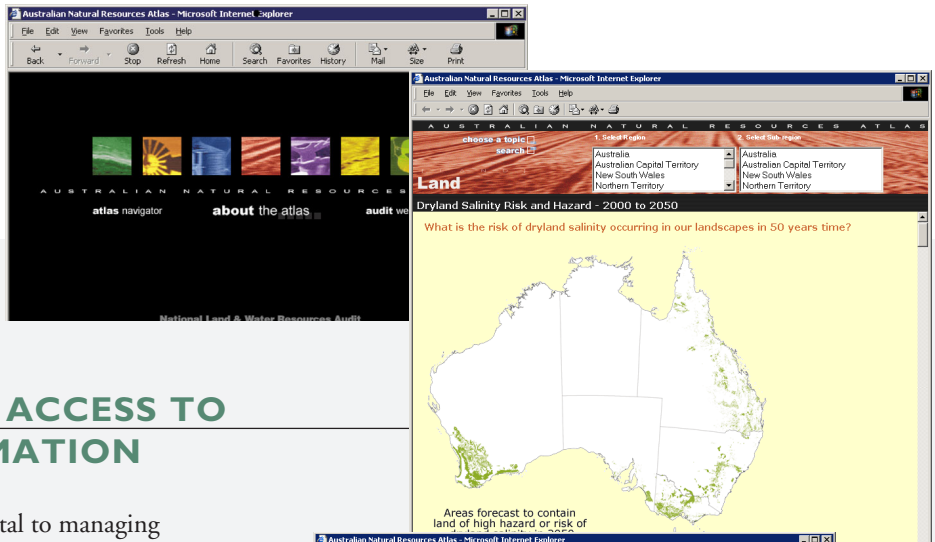


PROVIDING ACCESS TO INFORMATION

Information is fundamental to managing landscape health. This assessment forms part of the Australian Natural Resources Atlas (Atlas)—an internet-based resource for data, maps and links to related sites. The Atlas is organised by subject and geography.

Subjects include:

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

Landscape health topics are:

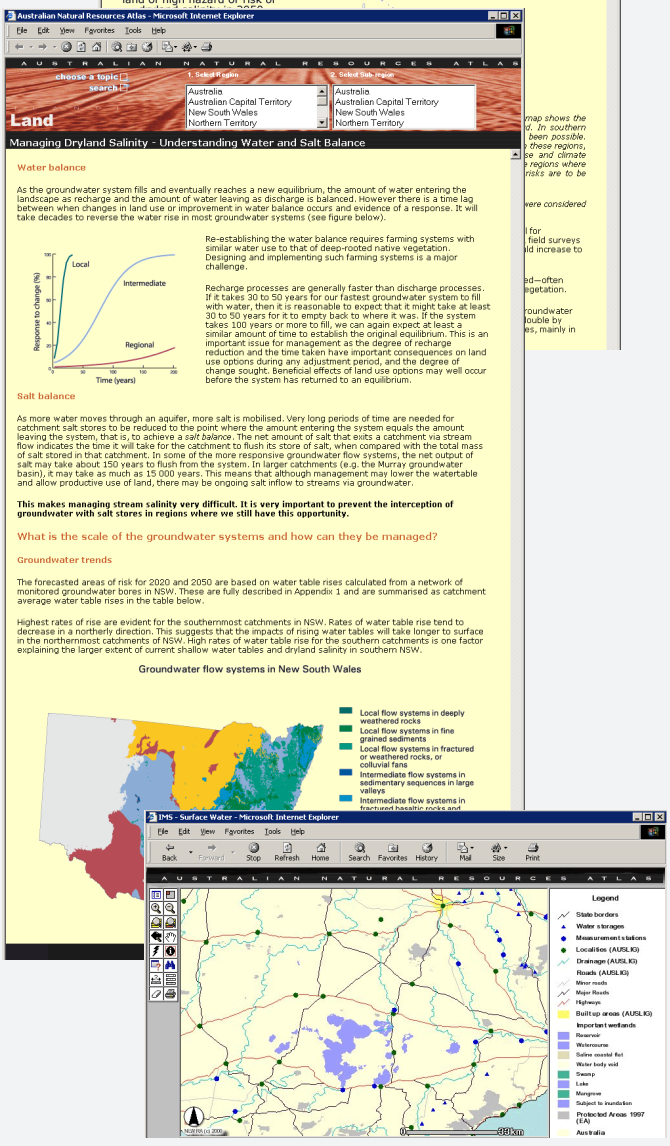
- landscape stress
- status of native vegetation
- exotic biota
- changed hydrological conditions
- status of threatened species
- status of protective measures

Information products are presented for the whole of Australia, by State and Territory and by subregion.

Landscape health information products will be available on the Atlas from January 2002.

Make your own on-line map

Landscape health information 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

Landscape Health in Australia was prepared by the National Land and Water Resources Audit in partnership with State of Environment Reporting and the National Reserve System sections of Environment Australia, and State and Territory agencies.

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