Back from the Brink

Increasing the awareness of threatened species and communities in our schools



TEACHER RESOURCE

Threatened species and communities in the Northern Agricultural Region

Activities for Middle Childhood and Early Adolescence

Australian Government

Department of Environment and Conservation
Our environment, our future

BACK from the BRINK

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managing natural resources in WA's Mid West

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Contents

The vulnerable stromatolite community of Lake Thetis.

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All photos by DEC.

Fact sheets

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Overview of the teacher resource

The Northern Agricultural Region (NAR) is internationally renowned for its high level of biodiversity and is recognised as one of the most floristically diverse areas in the world. Associated with this high level of biodiversity are many threatened species and communities.

The NAR is home to more than 100 species of threatened flora, about 30 species of threatened fauna and about 20 threatened ecological communities. The NAR stretches from Guilderton in the south to Kalbarri in the north and Dalwallinu and Mullewa in the east, covering an area of 7.5 million hectares.

Species extinction is not a new process, but it is of significant concern that the rate of extinction today is estimated to be at least 100 times the natural rate. Human activities are directly responsible.

Worldwide, there are many reasons for extinctions, including hunting and poaching, disease, pollution, habitat loss and the effects of introduced species. The NAR is no different, with many species of flora and fauna, as well as ecological communities, being pushed closer to the brink of extinction.

Footes grevillea (*Grevillea calliantha*).

Back from the Brink is a project working to secure a better future for our threatened species and communities in the NAR. This is largely achieved through implementing recovery actions such as survey and monitoring, research, education and capacity building and on-ground works. The project is implemented by the Department of Environment and Conservation (DEC), funded by the Federal and State governments and administered by the Northern Agricultural Catchments Council.

This teacher resource contains fact sheets on threatened species and communities in the NAR, teachers' notes and student activities which are all linked to the Curriculum Framework set by the Curriculum Council of Western Australia. This pack can be used as a stand-alone resource or can be used as the basis of a more in-depth approach which may include field trips and visits from DEC staff. Pages may be photocopied for educational purposes.

The aims of this resource are:

- to develop school community awareness and appreciation of the **threatened species and communities** in the NAR;
- to develop school community awareness and understanding of **threatening processes** active in the NAR;
- to develop school community awareness and understanding of current best practice in threatened species and community **management**;
- to provide students with opportunities to achieve outcomes in the **Curriculum Framework** by learning about and gaining experience in threatened species and communities management; and
- to encourage students to value ecological sustainability through **involvement** in and **support** for threatened species management.

Target levels: Years 5 to 10

Activities can be modified for students with special needs.

Curriculum Framework links (Curriculum Council of Western Australia)

Overarching learning outcomes

1. Students use language to understand, develop and communicate ideas and information and interact with others.	**2.** Students select, integrate and apply numerical and spatial concepts and techniques.	**3.** Students recognise when and what information is needed, locate and obtain it from a range of sources and evaluate, use and share it with others.	**4.** Students select, use and adapt technologies.	**5.** Students describe and reason about patterns, structures and relationships in order to understand, interpret, justify and make predictions.	**6.** Students visualise consequences, think laterally, recognise opportunity and potential and are prepared to test options.	**7.** Students understand and appreciate the physical, biological and technological world and have the knowledge, skills and values to make decisions in relation to it.	**8.** Students understand their cultural, geographic and historical contexts and have the knowledge, skills and values necessary for active participation in life in Australia.	**9.** Students interact with people and cultures other than their own and are equipped to contribute to the global community.	**10.** Students participate in creative activity of their own and understand and engage with the artistic, cultural and intellectual work of others.	**11.** Students value and implement practices that promote personal growth and well-being.	**12.** Students are self motivated and confident in their approach to learning and are able to work individually and collaboratively.	**13.** Students recognise that everyone has the right to feel valued and be safe, and, in this regard, understand their rights and obligations and behave responsibly.

Values

Pursuit of knowledge and a commitment to achieve their potential.	**Self acceptance and respect of self.**	**Respect and concern for others and their rights.**	**Social and civic responsibility.**	**Environmental responsibility.**

Society and Environment learning outcomes

1. Investigation, Communication and Participation Students investigate the ways people interact with each other and with their environments in order to make informed decisions and implement relevant social action.	**2. Place and Space** Students understand that the interaction people have with places in which they live is shaped by the location, patterns and processes associated with natural built features.	**3. Resources** Students understand that people attempt to meet their needs and wants by making optimum use of limited resources in enterprising ways.	**4. Culture** Students understand that people form groups because of their shared understandings of the world, and, in turn, they are influenced by the particular culture so formed.	**5. Time, Continuity and Change** Students understand that people's actions and values are shaped by their understanding and interpretation of the past.	**6. Natural and Social Systems** Students understand that systems provide order to the dynamic natural and social relationships occurring in the world.	**7. Active Citizenship** Students demonstrate active citizenship through their behaviours and practices in the school environment, in accordance with the principles and values associated with the democratic process, social justice and ecological sustainability.

Science learning outcomes

1. Investigating Students investigate to answer questions about the natural and technological world using reflection and analysis to prepare a plan; to collect, process and interpret data; to communicate conclusions; and to evaluate their plan, procedures and findings.	**2. Communicating Scientifically** Students communicate scientific understanding to different audiences for a range of purposes.	**3. Science in Daily Life** Students select and apply scientific knowledge, skills and understandings across a range of contexts in daily life.	**4. Acting Responsibly** Students make decisions that include ethical consideration of the impact of the processes and likely products of science on people and the environment.	**5. Science in Society** Students understand the nature of science as a human activity.	**6. Earth and Beyond** Students understand how the physical environment on Earth and its position in the universe impact on the way we live.	**7. Energy and Change** Students understand the scientific concept of energy and explain that energy is vital to our existence and to our quality of life.	**8. Life and Living** Students understand their own biology and that of other living things and recognise the interdependence of life.	**9. Natural and Processed Materials** Students understand that the structure of materials determines their properties and that the processing of raw materials results in new materials with different properties and uses.

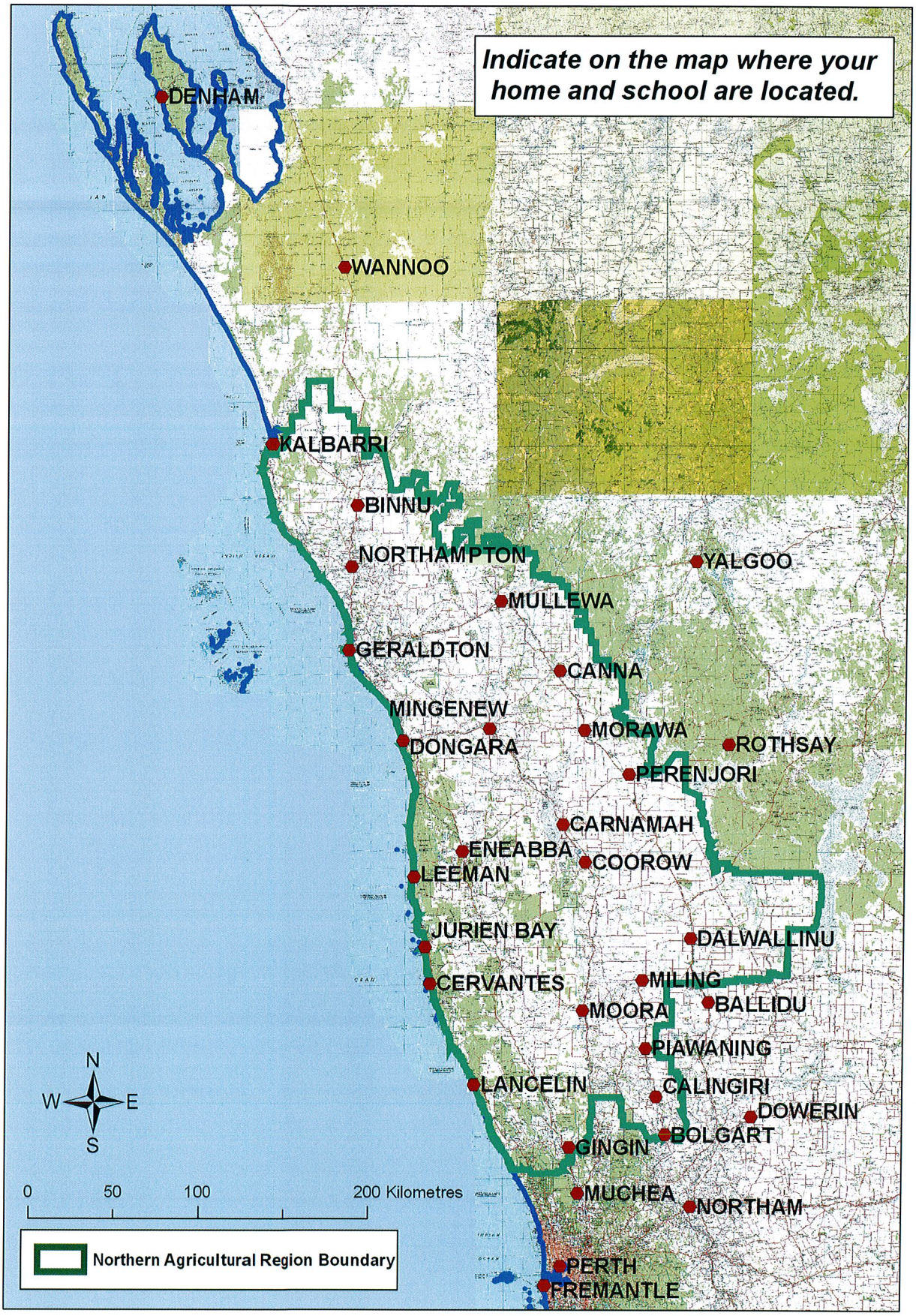
Cross-curricular link to English learning outcomes

1. Understanding Language	**2. Attitudes, Values and Beliefs**	**3. Conventions**	**4. Processes and Strategies**	**5. Listening**	**6. Speaking**	**7. Viewing**	**8. Reading**	**9. Writing**

Cross-curricular link to Mathematics learning outcomes

1, 2 Appreciating Mathematics	**3, 4, 5 Working Mathematically**	**6, 7, 8 Number**	**9, 10, 11 Measurement**	**12, 13, 14 Chance and Data**	**15, 16 Space**	**17, 18, 19 Algebra**

Map of the Northern Agricultural Region



Important definitions

Annual: a plant that completes the full life cycle from germination to fruiting within a single year and then dies.

Critically endangered: an ecological community or species that is facing an extremely high risk of total destruction in the immediate future.

Degradation: a decline in quality (of habitat, caused by a threatening process).

Disturbance opportunists: a flora species which requires natural disturbance, such as a fire or flood, to germinate.

Ecological community: a naturally occurring biological assemblage (an assemblage of plants, animals and organisms) that occurs in a particular type of habitat.

Endangered: an ecological community or species that is facing a very high risk of total destruction in the near future.

Fauna: animals.

Flora: plants.

Habitat: the area or environment where an organism (such as a plant or an animal) or ecological community normally lives or occurs.

Habitat fragmentation: clearing of once continuous vegetation leaving small isolated remnants.

Inflorescence: the general arrangement of flowers on a stem, often referred to as the flower cluster.

Insectivorous: feeds on insects.

Introduced species: an animal or plant that occurs in any area, but does not occur there naturally.

Land clearing: the removal of native vegetation.

Laterite: red soil, rock or gravel that is rich in iron and aluminum.

Monitoring: regularly undertaking measurements and collecting data in order to identify changes and trends.

Occurrence: a discrete population, separated from other populations of the same community or species.

Perennial: a plant that lives for a number of years and does not die after flowering or fruiting once.

***Phytophthora* dieback:** a fungal plant disease causing roots to rot; the plant is unable to suck up water or nutrients from the soil and therefore dies.

Pollen: part of the flower that contains the male genetic material in reproduction and is essential for seed production.

Recovery process: the process of undertaking actions to improve the status of threatened species or communities.

Rehabilitation: helping damaged or cleared native vegetation to recover to as close as possible to its natural state.

Remnant vegetation: area of native vegetation that still occurs in areas where vegetation has mostly been cleared.

Restoration: returning an ecological community to as close as possible to its natural state after disturbance.

Shrub: a woody plant of smaller structure than a tree and one that produces shoots or trunks from the base.

Species: a group of plants or animals that can breed among themselves to produce offspring that can breed.

Stamens: the male part of the flower in seed producing plants.

Stigma: the female part of the flower that receives the pollen.

Translocation: to introduce a species by either planting flora or releasing fauna species to a secure area.

Threatened: at risk of dying out (becoming extinct) in the near future.

Threatening process: any process or activity that threatens to destroy or significantly modify the ecological community and/or affect the continuing evolutionary processes within any ecological community.

Vulnerable: an ecological community or species that has been adequately surveyed and is not critically endangered or endangered but is facing a high risk of total destruction in the medium to long-term future.

Fact sheet – Threatened flora

Threatened flora of the Northern Agricultural Region

Rough emu bush *(Eremophila scaberula)* Status: **Critically endangered**

Location: Moora **Habitat:** Rich loam and clay flats
Description: Low spreading shrub with rough, slightly sticky branches and foliage; leaves which are four to eight millimetres long; solitary flowers which are a pale to dark purple; flower tube 10 to 12 millimetres long; flowers July to November.

Prostrate flame pea *(Chorizema humile)* Status: **Critically endangered**

Location: Coorow, Carnamah and Bindi Bindi **Habitat:** Red loam or brown sandy clay plains
Description: Low growing shrub up to 80 centimetres in diameter; leaves four to 16 millimetres long, 2.5 to five millimetres wide and arranged alternately along the stem; clusters of pea flowers held on ends of branches, composing of up to 30 flowers; petals yellow with red-brown markings; flowers July to September.

Mount Lesueur grevillea *(Gevillea batrachioides)* Status: **Critically endangered**

Location: Jurien Bay **Habitat:** Flat sandstone outcrop in brown sandy loam
Description: Bushy shrub up to two metres tall with rounded, hairy branchlets and stiff leaves; leaves 15 millimetres long; flowers red and in simple inflorescences about five centimetres long; stalks 12 to 13 millimetres long; flowers hairy outside with few hairs inside; flowers September to October.

Footes grevillea *(Grevillea calliantha)* Status: **Critically endangered**

Location: Dandaragan **Habitat:** Areas of low heath
Description: Grow to about two metres tall and three metres wide; flowers greenish-yellow when young, changing to orange with a dark-red style with age; leaves greyish-yellow-green in colour; flowers September to February.

Dark-bract banksia *(Banksia fuscobractea)* Status: **Critically endangered**

Location: Gillingarra **Habitat:** Grey sands over laterite in low heath
Description: Small shrub growing up to one metre; leaves wedge shaped and about four to seven centimetres long and one to three centimetres wide; leaves completely smooth; inflorescences yellow in colour and contain 180 to 190 flowers.

White featherflower *(Verticordia albida)* Status: **Critically endangered**

Location: Three Springs **Habitat:** White-grey to yellow sand over gravel in scrub or heath
Description: Tall shrub up to 2.6 metres high; leaves rounded with smooth margins, two to 4.5 millimetres wide; white flowers with pink centre, held in dense spikes; flowers late November to January.

Spiral-fruited wattle Status: **Critically endangered**
(Acacia cochlocarpa subsp. *cochlocarpa)*

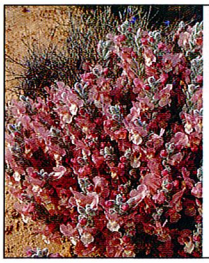
Location: Watheroo **Habitat:** Primarily grows in disturbed roadsides or sand, or clayey sand with laterite
Description: Sprawling shrub up to 70 centimetres tall; branchlets slightly zigzagging; golden pom-pom flower heads; seed pods tightly curled; flowers June to July.

Red snakebush *(Hemiandra gardneri)* Status: **Critically endangered**

Location: Watheroo **Habitat:** Deep yellow to yellow white sand on sand-plains and hills
Description: Perennial shrub forming a mat up to 10 centimetres high and two metres in diameter; primary stems usually up to 40 centimetres long; linear or very narrow leaves; dark-red to pink flowers, clustered towards ends of stems; flowers September to January.

Fact sheet – threatened flora

Threatened flora of the Northern Agricultural Region



Native foxglove or woolly foxglove Status: **Critically endangered**
(Pityrodia axillaris)

Location: Perenjori to Dalwallinu **Habitat:** Shrubland on yellow sand
Description: Small shrub growing to approximately 30 centimetres in height; stem and leaves covered with dense, white, woolly hairs; leaves are stalkless and egg-shaped, growing approximately two to four centimetres long and one to 15 millimetres wide; flowers solitary or arranged in clusters of three to five on main stem; flowers deep-red to yellowish-scarlet in colour.

Northampton midget greenhood Status: **Critically endangered**
(Pterstylis sp. Northampton)

Location: Northampton **Habitat:** Low heath in winter-wet clay soils
Description: Small herb growing five to 10 centimetres in height; flower-spike containing two to 20 pale greenhood flowers; flowers wither after fruiting and plant enters a period of annual dormancy; survives as underground tubers until the next season; flowers August to early September.

Mallee box *(Eucalyptus cuprea)* Status: **Critically endangered**

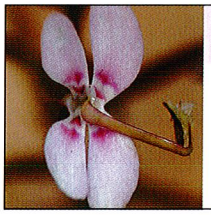
Location: Northampton **Habitat:** Brown sand loam with sandstone or granite
Description: Grows four to six metres tall; flakey dark grey bark on lower half of trunk, smooth coppery or grey bark above; glossy dark green adult leaves; sparse oil glands; small white flowers; flowers August to November.

Net-veined gyrostemon *(Gyrostemon reticulatus)* Status: **Critically endangered**

Location: Tardun **Habitat:** Very dense shrubland with melaleuca, acacia and sheoak
Description: Erect shrub growing to about one metre in height; crowded leaves 11 to 35 millimetres long, circular in cross section occasionally with hooked tips; solitary fruit, spherical, about three millimetres long.

Mingenew everlasting Status: **Endangered**
(Schoenia filifolia subsp. *subulifolia)*

Location: Once occurred between Walkaway and Geraldton, now occurs only around Mingenew
Habitat: Swampy flats and damp flats on pale yellow-grey brown clay
Description: Erect annual daisy growing to 50 centimetres tall; leaves circular in cross-section; flower head consisting of a number of small flowers; flowers August to October.

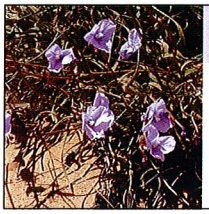


Endearing triggerplant *(Stylidium amabile)* Status: **Critically endangered**

Location: Maya **Habitat:** Sandy lateritic gravel high in the landscape
Description: Perennial herb growing between eight and 15 centimetres high; leaves up to six centimetres long; forms a compact rosette flower, white and pink in colour; flowering stalks up to 28 centimetres tall; flowers September to October.

Scaly-leaved featherflower Status: **Critically endangered**
(Verticoridia spicata subsp. *squamosa)*

Location: Yandanooka and Three Springs **Habitat:** Deep yellow sand in low scrub
Description: Attractive compact shrub growing to one metre tall and one metre wide; rounded to elliptic shaped leaves; masses of pinkish white feathery flowers; flowers October to December.



Spiral-leaved patersonia *(Patersonia spirafolia)* Status: **Endangered**

Location: Badgingarra **Habitat:** Low hills in sand over laterite supporting low, species-rich health
Description: Herbaceous perennial forming a tussock up to 40 centimetres across; produces two to 15 slender stems up to 30 centimetres high; linear, spirally-twisted leaves up to 20 centimetres long; flowers bluish-violet in colour; flowers October to November.

Fact sheet – Threatened fauna

Threatened fauna of the Northern Agricultural Region

Dibbler *(Parantechinus apicalis)* Status: **Endangered**

Location: Whitlock Island and Boullanger Island in Jurien Bay; areas of Western Australia's south coast
Habitat: Heath with plentiful flowers and thick leaf litter
Description: Head and body length to about 145 millimetres; tail length of 95 to 115 millimetres; tail thickened at base, tapering to a point and covered with dense hairs; females weigh 40 to 75 grams; males weigh 60 to 100 grams; brownish-grey in colour above, freckled white and grey below; have very distinct white eye rings; breed in March, having up to eight young.

Australian sea lion *(Neophoca cinerea)* Status: **Specially protected**

Location: Coastal waters and islands of southern Western Australia and South Australia
Habitat: Breeding occurs on rocks and sandy beaches on sheltered sides of islands with shallow protected pools Description: Large marine mammal, with males reaching more than two metres in length and up to 300 kilograms in weight and females measuring more than 1.5 metres and 80 kilograms; blunt snout and tightly rolled external ears; front and hind flippers; males are chocolate brown in colour, females smaller and silvery ash-grey colour above with yellow to cream colour on the under parts.

Carnaby's (short-billed) black-cockatoo *(Calyptorhynchus latirostris)* Status: **Endangered**

Location: south-west Western Australia, Kalbarri to Esperance
Habitat: Eucalypt woodland breeding sites, commonly salmon gum or wandoo; coastal feeding sites, commonly banksia and hakea heath
Description: White tail panels, white cheek patches and short bill; lifespan of up to 50 years in the wild; lay two eggs but mostly raise only one chick; nest in deep hollows of large eucalypt trees.

Malleefowl *(Leipoa ocellata)* Status: **Vulnerable**

Location: Widespread throughout Western Australian wheatbelt; also occurs in South Australia, Victoria and New South Wales Habitat: Tall mallee, low woodland or acacia scrub on sandy soils, with complete canopy and abundant litter Description: Black, brown and grey in colour; 60 to 70 centimetres in length and up to two kilograms, with males generally larger than females; robust; large feet; lifespan of up to 30 years; breeding August to April; maturity reached after at least two years; create large breeding mounds of up to five metres in diameter to incubate eggs.

Lancelin Island skink *(Ctenotus lancelini)* Status: **Vulnerable**

Location: Lancelin Island Habitat: Vegetated areas on sand and shallow soil over limestone
Description: Small skink up to 220 millimetres long and weighing about 10 grams at maturity; elongated body, short limbs; upper body pale brown with several wavy lines of dark spots; tail grey with dark flecks; flanks have several white stripes; yellow legs; females lay clutches of two to five eggs in early summer.

Western spiny-tailed skink *(Egernia stokesii badia)* Status: **Vulnerable**

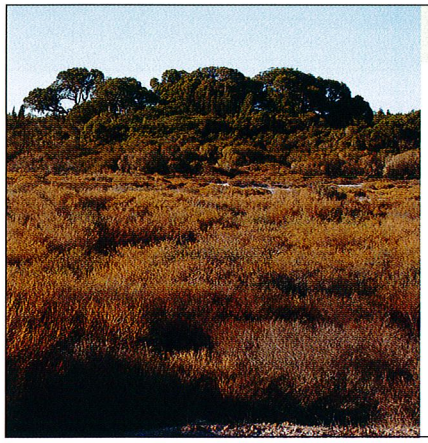
Location: Central wheatbelt Habitat: Semiarid woodlands providing hollow logs and rocky outcrops
Description: Up to 280 millimetres in length; large and robust; brown, reddish-brown back marked with angular greyish-white spots; distinctive spiny tail; live in small family groups; give birth to live young.

Shield-backed trapdoor spider *(Idiosoma nigrum)* Status: **Vulnerable**

Location: Shark Bay to Beverly Habitat: Acacia woodland or scrubland
Description: Carapace 10 millimetres long and seven millimetres wide; dark greyish-brown in colour, sometimes with reddish tinge; burrow lined with white silk with a fan of twigs attached to rim, usually arranged in a 'moustache' fashion; trapdoor made of litter fragments bound with silk.

Fact sheet – Threatened Ecological Communities

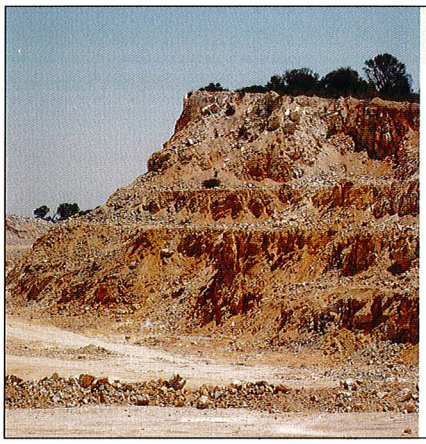
Threatened Ecological Communities of the Northern Agricultural Region



Mound springs of the Three Springs area

Location: Three Springs area Status: **Critically endangered**

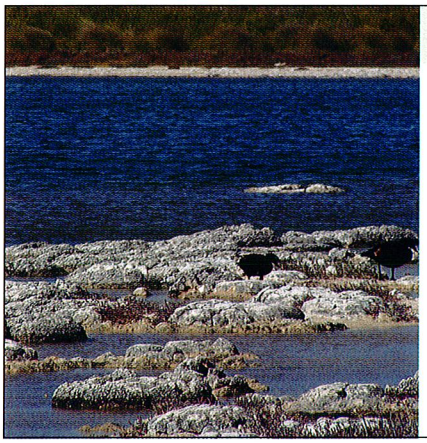
Description: Organic mound springs are a unique community formed in areas where fresh ground water flows out of the ground forming large mounds of peat (decayed plant material). It is a moist community, often in a dry landscape, and is home to moisture-loving plants that are normally associated with wetlands, rivers and streams, including melaleucas (paperbarks) and tall eucalypts such as river gum (*Eucalyptus camaldulensis*) and flooded gum (*Eucalyptus rudis*). The mound springs are also home to fauna such as frogs and diverse array aquatic invertebrates including water mites, flatworms, beetles, copepods, worms and insects.



Floristic community of the Chert Hills

Location: Coomberdale, Watheroo area Status: **Critically endangered**

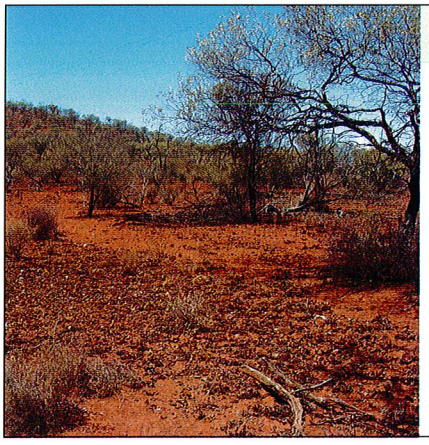
Description: The Coomberdale Chert Floristic Community is best described as an assemblage of plant species that only occur together on one landform type; the Chert Hills north of Moora. Chert is a type of quartzite rock and the Chert Hills are dominated by massive cream rock (large boulders) with little or no top soil. The group of plants that grows as thick heath on these Chert ridges and hills is unique due to the lack of top soil and is made up of a number of threatened flora species including *Synaphea quartzitica*, *Davisia dielsii*, *Goodenia arthrotricha* and *Acacia aristulata*.



Stromatolite community of Lake Thetis

Location: Cervantes Status: **Vulnerable**

Description: Lake Thetis is a small coastal lake near Cervantes that contains water 1.5 times saltier than the sea. The rich ground water that discharges into the lake contains minerals such as calcium and bicarbonate; minerals that are necessary for the formation and growth of stromatolites. Stromatolites are a complex of microbial communities consisting of many different types of micro-organisms that grow together in a dome-shaped formation. While these formations look similar to rocks they are actually some of the oldest living things on Earth. The stromatolites of Lake Thetis form around the edge of the lake, reach one metre in diameter and are thousands of years old.



Plant assemblages of the Moonagin System

Location: Moonagin and Milhun Ranges Status: **Vulnerable**

Description: These plant assemblages cover the fine-grained rocks on the ranges. They are unique due the distinctive geology and vegetation found in a restricted area. The plant species that occur in this area are:

- acacia scrub on red soil on the summits and slopes of the hills;
- acacia scrub with scattered *Eucalyptus loxophleba*;
- *Eucalyptus oleosa* on red loam flats on the foothills; and
- *Eucalyptus loxophleba* woodland on red loam flats of the pediments.

Fact sheet – Threat and recovery action examples

FLORA

Threatening processes:

- road, rail and firebreak maintenance
- weed competition
- inappropriate fire regimes
- lack of disturbance
- lack of recruitment
- grazing and trampling by stock and feral animals
- disease such as *Phytophthora* dieback
- recreational impacts
- habitat degradation
- chemical pollutants
- habitat fragmentation
- gravel extraction
- farming activities
- climate change
- land clearing
- salinity

Recovery actions:

- liaison with landholders and shires
- surveys for new populations
- rare flora markers
- protection from road and rail maintenance
- fencing to keep out grazing animals
- fire management plan
- implementation of *Phytophthora* dieback hygiene
- induced recruitment stimulation
- habitat enhancement
- awareness raising
- weed control
- seed collection
- monitoring
- revegetation
- translocations

FAUNA

Threatening processes:

- competition from introduced species
- land clearing
- predation by introduced species
- inappropriate fire regimes
- climate change
- habitat fragmentation
- salinity
- loss of natural food sources
- poaching and hunting
- chemical pollutants
- recreational impacts
- introduced diseases
- habitat degradation

Recovery actions:

- introduced species control
- translocations
- recovery networks or groups
- monitoring of populations
- raising awareness
- research into biology behaviour and population ecology
- habitat protection
- liaison with industry and community
- revegetation
- development of corridors
- protection from poaching

THREATENED ECOLOGICAL COMMUNITIES

Threatening processes:

- changes in hydrology
- inappropriate fire regimes
- weed invasion
- clearing for agriculture
- mining
- damage from recreational activities
- changes in water quality
- pollution
- grazing

Recovery actions:

- weed control
- fencing to prevent grazing
- conducting surveys
- monitoring communities
- liaision with landholders
- fire management plans
- habitat protection through the creation of conservation reserves
- education and awareness raising

Teachers' notes – Overview

Classified as threatened

Western Australia has a number of threatened flora, fauna and ecological communities that are listed under the State Wildlife Conservation Act. The lists are updated annually. Before a species or ecological community is listed as threatened, a thorough survey is carried out to determine the number of plants or animals remaining and to determine if the species is in danger of extinction or in need of special protection.

Categories of threat (for example critically endangered) are assigned to each species and ecological community based on the definitions developed by the Species Survival Commission of the World Conservation Union (IUCN). This allows Western Australian threatened species lists to be recognised at an international level. The IUCN Red List category definitions are outlined below in Table 1 below.

Table 1 International standard for classification

IUCN Red List category definitions	
Extinct	A taxon is extinct when there is no reasonable doubt that the last individual has died.
Extinct in the wild	A taxon is extinct in the wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range.
Critically endangered	A taxon is critically endangered when the best available evidence indicates that it meets any of the criteria for critically endangered and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Endangered	A taxon is endangered when the best available evidence indicates that it meets any of the criteria for endangered and it is therefore considered to be facing a very high risk of extinction in the wild.
Vulnerable	A taxon is vulnerable when the best available evidence indicates that it meets any of the criteria for vulnerable and it is therefore considered to be facing a high risk of extinction in the wild.

Fauna that does not meet the criteria for the above categories but are otherwise in need of special protection as they are of high commercial value, for example, may be categorised as 'specially protected'.

For the majority of listed species, DEC aims to develop a recovery plan that will:

- provide a brief background of the species or ecological community;
- state the objective to be achieved within the plan's time frame;
- provide quantifiable/measurable criteria for success and failure;
- prescribe actions needed to conserve the species;
- estimate costs;
- identify source of funding;
- allocate responsibility for implementing actions; and
- ensure ongoing monitoring of the species.

Teachers' notes – Overview

Biodiversity management

Indigenous culture in the Northern Agricultural Region

The natural environment of the NAR holds great cultural significance for two Aboriginal groups – Yamatji (also spelt Yamaji) and Nyoongar. Six or more Yamatji language groups occur in the NAR, north of Greenhead, and at least two Nyoongar language groups occur in the NAR, south of Greenhead.

Natural resources are used extensively in Aboriginal culture, from a wide range of food sources to tool-making materials. The traditional owners of the land have a deep spiritual relationship with the environment and there is undoubtedly a lot that can be learnt from such values.

Protection of threatened species

- Legislation is in place to ensure species and habitat cannot be taken or disturbed without the proper authority.
- Recovery plans are written in order to set guidelines of, and priorities for, management actions for threatened species and communities.
- Management actions are undertaken both *in situ* (in the species' natural habitat) and *ex situ* (in artificial environments such as zoos or seed storage banks).

Partners involved in threatened species management in the Northern Agricultural Region:

- DEC's Regional Services Division, Species and Communities Branch, Science Division, WA Herbarium, Nature Protection Branch, Threatened Flora Seed Centre.
- Aboriginal groups
- Botanic Gardens and Parks Authority
- Commonwealth Government
- Local Regional Herbarium
- Northern Agricultural Catchments Council (NACC)
- Recovery teams
- Shires and community members
- Staff and students of educational institutions
- Utility services (for example rail and road authorities)
- Volunteers

Black-flanked rock wallaby survey.

Teachers' notes – Overview

Threatening processes

Threatening processes are the activities or agents that cause species and communities to become threatened with extinction.

In Western Australia, land clearing for agriculture, urban use and other land developments has had a catastrophic impact on our natural environment. Very few species or communities benefit from clearing and most disappear from cleared areas. In recent years, society has tried to balance habitat destruction with the creation of conservation reserves, which are protected.

Fortunately there is land that has been left uncleared in agricultural regions. However most of these bush remnants are small and isolated. This process is called **habitat fragmentation** and leads to gradual loss of species. This is because most remnants are too small for sufficient numbers of the species to survive and because intervening gaps are too large or too inhospitable for species to move between remnants.

Where habitat is available, the quality is often reduced from its natural state. This is known as **habitat degradation** and can be the result of introduced diseases, altered hydrology, inappropriate fire regimes, grazing, chemical drift, weed invasion, introduced predators and other causes.

Salinity is a significant problem in WA and is caused by the removal of native vegetation for farming or other land uses. Water that would normally be absorbed by the vegetation flows down to the water table, causing its level to rise, bringing salt from the soil to the surface and making it uninhabitable for most species. Such clearing also leads to **water logging** which can kill any remaining vegetation in the area.

Pollution in the form of material waste will degrade the natural environment through processes such as poisoning and nutrient enrichment. This includes exposure to chemicals used in farming and industry which may drift or drain into surrounding areas.

Fire is a part of Western Australia's natural environment and has been one of the driving forces in the evolution of native plants and animals. Some native plants rely on periodic fire for their survival as a species, with seeds not germinating unless they have been subjected to a fire. Timing of fires is critical for biodiversity. Sufficient time must be left between burns to enable plants to regenerate and populations of wildlife to establish. However, if the bush is left too long between burns, dead vegetation can accumulate to dangerous levels so that when there is a fire it can burn fiercely and damage the environment and property. Many of our threatened flora species are at risk because the fire regime has altered considerably over the past 200 years, with fires now occurring either too frequently or not frequently enough for the species to regenerate and survive.

Introduced predators such as the fox, cat and black rat have had a major impact on Australian fauna, as native species have not evolved with, and developed defences for, these new threats.

Introduced herbivores such as rabbits, pigs and goats compete with native herbivores for food and damage plants through grazing and trampling, leading to erosion, the spread of weeds and diseases and other effects.

Weeds degrade and alter habitats by competing with native flora, limiting food supply for fauna and changing the ecosystem's susceptibility to fire.

***Phytophthora* dieback** disease is caused by an introduced microscopic organism called *Phytophthora cinnamomi* (pronounced fy-top-thera sin-a-moe-my). It is a water mould that damages the roots of plants, causing them to die from lack of water and nutrients. It prevents those plants from re-establishing on the site, leading to permanent major changes in the ecosystem. *Phytophthora* dieback spreads through the movement of spores through water and soil and human movement can increase the likelihood of spreading the disease as this transports soil on vehicle tyres and footwear.

The death of diseased plants upsets the ecosystem. It means less food and shelter for native plants and animals and can make it easier for the invasion of weeds and changed fire patterns. Diseased plants can be treated with a safe chemical called phosphite, which can be injected by hand into tree trunks or sprayed onto their leaves. Phosphite helps to 'switch on' the plant's immune system to fight the disease, as well as being a mild fungicide. It does not solve the problem, rather it slows the spread.

Activity 1: Introduction to threatened species

Teachers' notes

Comprehension activity

A clues sheet is provided to help students answer a number of questions. The purpose of this activity is to give students an introduction and brief background on threatened species and communities. At the beginning of this activity, hold a class discussion on what are threatened species and communities. A KWL chart (diagram below) would be beneficial.

The first part of the activity asks the students to find definitions of words related to threatened species and communities. This can be completed using the clue sheet, dictionary, internet or other resource materials.

The second part of the activity involves reading information or using background knowledge and answering general questions about the topic. When they have finished this sheet students can complete the threatened species word search.

Resources

- Clues sheet
- Word search
- Dictionary
- Internet

Curriculum links

Overarching outcomes: 1, 3, 7

Values: Social and Civic Responsibility, Environmental Responsibility

Learning area outcomes:

Society and Environment: Investigation, Communication and Participation; Place and Space; Natural and Social Systems

English: Reading; Writing

Science: Life and Living

Evaluation

- Were students able to find definitions of the words?
- Were students able to locate and use the right information from the given clue sheet?
- Could students give examples of positive and negative environmental impacts in the local area?

Other activities related to this activity

- Students create their own word sleuths for a partner to complete.
- Students create a dictionary or their own glossary on words that are related to the topic.

KWL chart

Know (What students know)	**Want** (What students want to know)	**Learnt** (What students have learnt)

Activity 1: Clues

The Northern Agricultural Region (NAR) is very special, even on a global level, because it has an outstanding array of flora species. The area is known as one of the most floristically diverse areas in the world. Associated with the large number of different species that live here, the NAR is home to many threatened species and communities.

The NAR is home to more than 100 species of threatened flora, about 30 species of threatened fauna and about 20 threatened ecological communities.

Threatened species are plants and animals that are at significant risk of becoming extinct.

Threatened ecological communities are naturally occurring groups of plants and/or animals that occur in a particular type of habitat and are under threat of extinction.

The **habitat** is the place where species live, containing all the necessities for them to survive, such as space, light, water and food.

Although a lot of good work is being done, the human population has the ability to change habitats and upset the balance of nature. Some examples of how humans have a negative effect on the natural environment are:

- pollution from vehicles and industry;
- use of chemicals such as pesticides;
- introduction of animals and plants into an area of bush where they don't normally belong;
- clearing of native vegetation for farming, roads and cities; and
- damming rivers to provide water.

Living things are a life support of our planet. They produce the oxygen we breathe, dispose of waste, pollinate our crops, control climate, generate and recycle nutrients. We need them to keep our planet healthy and in balance.

Here are nine ways you can help conserve the natural environment:

1. Visit national parks and conservation reserves to find out if there are any threatened species and how they are being protected. Make sure to follow all regulations of the national park.
2. Encourage friends and family to keep patches of bush on their property as wildlife habitats.
3. Join local groups to help care for a local area of bushland, for example removing rubbish and weeds.
4. Plant native plants local to the area in your backyards or farms rather than introduced plants.
5. Do not dump pets or garden waste in the bush.
6. Control cats, dogs and stock.
7. Follow fishing rules and regulations.
8. Reuse or recycle whatever you can.
9. Make compost for your gardens from kitchen scraps and garden waste.

Activity 1: Introduction to threatened species

1. Read and discuss the information on page 15.
2. What is meant by:

Fauna: _____

_____

Flora: _____

_____

Habitat: _____

_____

Threatened: _____

_____

Extinct: _____

_____

3. How many species of threatened flora are located in the NAR? _____
4. List three things you have seen in your local area that are **good** for the local environment:

1. _____
2. _____
3. _____

5. List three things you have seen in your local area that are a **problem** for the local environment:

1. _____
2. _____
3. _____

6. Un-jumble these words:

baithat teednhreta cpisees aunfa

Activity 1: Threatened species word search

G	E	L	T	R	U	T	D	A	E	H	R	E	G	G	O	L	A	S	I	M	L	S	W	R
P	U	N	G	E	N	T	J	A	C	K	S	O	N	I	A	O	F	P	M	O	T	L	C	O
W	P	R	H	F	B	N	S	L	K	I	Y	L	O	N	T	G	K	R	S	L	R	T	N	S
E	S	T	R	C	T	S	B	M	Y	R	O	M	I	D	I	B	U	E	B	E	A	C	J	D
S	K	V	M	A	L	L	E	E	F	O	W	L	L	A	V	R	P	A	R	S	D	I	I	H
T	R	B	X	R	G	E	R	N	T	U	P	N	A	V	A	B	W	D	T	S	H	T	M	N
E	A	H	F	N	Y	D	S	R	R	G	R	Y	E	M	S	T	G	I	E	E	M	R	R	M
R	H	J	O	A	H	Z	T	S	O	H	G	F	S	K	S	R	R	N	P	R	F	K	E	T
N	S	S	A	B	S	I	B	D	I	E	H	B	N	O	A	M	Z	G	D	N	Z	N	S	L
S	E	U	I	Y	X	J	A	F	S	M	N	C	A	S	L	C	S	G	O	O	F	I	P	E
P	T	L	G	S	H	L	S	Q	B	U	T	L	I	G	S	N	Q	R	M	D	P	K	L	S
I	I	P	S	C	N	K	O	U	Y	B	X	O	L	F	W	D	R	E	L	D	L	S	Q	U
N	H	W	H	O	D	W	Y	A	C	U	A	T	A	H	A	I	B	V	C	Y	R	Y	Y	E
Y	W	I	T	C	A	I	L	R	T	S	U	K	R	L	T	C	N	I	W	L	G	A	S	U
T	T	S	V	K	M	E	B	T	E	H	X	R	T	B	T	O	L	L	O	T	F	B	V	R
A	A	N	B	A	Y	N	S	B	E	L	M	D	S	R	L	R	K	L	G	R	S	N	M	G
I	E	R	F	T	D	F	A	G	L	T	D	H	U	S	E	S	P	E	Q	U	T	E	I	R
L	R	P	R	O	S	T	R	A	T	E	F	L	A	M	E	P	E	A	H	X	B	I	N	E
E	G	S	T	O	R	I	O	M	N	E	R	O	I	H	S	U	B	H	S	I	N	R	A	V
D	B	L	U	N	T	W	A	T	T	L	E	L	T	F	S	O	T	C	M	E	R	U	C	I
S	E	J	K	I	T	X	C	A	E	N	R	M	Y	H	F	L	A	H	W	V	E	J	S	L
K	R	E	X	L	A	R	E	H	O	O	K	P	O	I	N	T	P	O	I	S	O	N	P	L
I	S	P	I	R	A	L	F	R	U	I	T	E	D	W	A	T	T	L	E	W	E	P	O	E
N	B	U	E	R	S	Y	U	N	I	M	W	E	X	T	G	U	I	J	O	K	L	V	E	A
K	S	R	P	I	T	G	I	T	R	O	O	D	P	A	R	T	M	E	T	S	E	E	R	T

Flora

- ☐ blunt wattle
- ☑ hookpoint poison
- ☐ Mt Lesueur grevillea
- ☐ prostrate flame pea
- ☐ pungent jacksonia
- ☐ rough emu bush
- ☐ spiral fruited wattle
- ☐ spreading grevillea
- ☐ varnish bush
- ☐ vassals wattle

Fauna

- ☐ Australian sea lion
- ☐ Carnaby's cockatoo
- ☐ dibbler
- ☐ great white shark
- ☐ Jurien Bay skink
- ☐ lesser noddy
- ☐ loggerhead turtle
- ☐ malleefowl
- ☐ tree-stem trapdoor
- ☐ western spiny-tailed skink

Activity 2: Threatening processes

Teachers' notes

Threatening processes activity

The purpose of this activity is to help students become aware of their local natural environment and give them the opportunity to share their knowledge. It introduces students to threatening processes, their causes and what we can do to help. Students will become aware of examples of recovery actions currently in place in the NAR. To complete the following activity, use the 'Threat and recovery action examples' fact sheet (page 10) and the 'Activity two: clues' sheet (page 19). There is extra information on the 'Threatening processes teachers notes' pages (page 13).

For a warm-up activity, photocopy the 'Threat and recovery action examples' fact sheet (page 10) and cut out the boxes so each student receives one box. Students can then find someone with the corresponding pair to their box, i.e. threatening processes affecting flora matches with recovery actions for flora. Each pair then reads from their cards a threatening process and decide on the most appropriate recovery action to combat it. This can be repeated for a number of threatening processes.

In addition, teachers may like to discuss with the class their current understanding of threatening processes. Students may complete this activity using techniques such as 'jigsaw sharing' or 'expert groups'. Organise students into groups of four, with one or two designated threatening process for each group. The group then discusses and decides on the best recovery actions to combat the threat.

Now that students have learnt some information about threatening processes, the students can complete the questions on the activity sheet and follow up with the group activity where they will design a poster on conserving the natural environment. The purpose of this poster is to help educate other community members and their families on what they can do to help save threatened species and communities from possible extinction. Get them to think about why it is important to educate others on this issue.

Resources

- Clue sheets on threatening processes
- Teachers' notes on threatening processes
- Large sheets of paper
- Internet access

Curriculum links

Overarching outcomes: 1, 3, 7

Values: Social and Civic Responsibility; Environmental Responsibility

Learning area outcomes:

Society and Environment: Time, Continuity and Change; Natural and Social Systems; Active Citizenship

Science: Life and Living

English: Attitudes, Values and Beliefs; Reading; Writing

Evaluation

- Were students able to contribute to the class discussion on threatening processes?
- Did students design a poster that would help educate the community on conserving threatened species and communities?

Other tasks related to this activity

- Students complete a research project on threatening processes.
- Students create a survey to find out what other community members know about threatening processes.

Activity 2: clues

Threatening processes

Conservation categories

- **Extinct** – no longer in existence
- **Critically endangered** – facing an extremely high risk of extinction
- **Endangered** – facing a very high risk of extinction
- **Vulnerable** – facing high risk of extinction

Why species and communities become threatened

Some species and communities are naturally rare because they only exist in a very restricted habitat type. For example, the Lancelin Island skink is only known to occur naturally on Lancelin Island, which is only 7.5 hectares in size.

However, many species and communities are now under threat of extinction due to a number of human-induced threatening processes, such as habitat clearing. This modification of the environment has already led to the extinction of some WA species and threatens the survival of many others.

Threatening processes are the activities or agents that cause species and communities to become extinct. Examples of some threatening processes active in the NAR are:

- habitat clearing – such as for agriculture, industry and development;
- pollution – such as the introduction of harmful chemicals and materials;
- introduction of invasive species or diseases – such as weeds, foxes, cats and *Phytophthora* dieback disease;
- climate change – such as drought affects and change in weather patterns; and
- overexploitation – such as fishing and seed collecting.

Recovery actions are the things we can do to help reduce the threat of extinction for species and communities. Examples of some recovery actions in place in the NAR are:

- protecting habitat from clearing – such as fencing around areas or creating reserves;

Lancelin Island skink monitoring.

- controlling invasive species – such as removing weeds and baiting for foxes;
- translocating species by putting plants and animals in areas largely free of threatening processes; and
- researching – for example learning about the species biology and their needs for survival.

Why protect species?

- They may be ecological keystone species for the ecosystem. A keystone species is one that is important for the survival of many species.
- Each species is special and unique. Threatened species have genuine value and should be protected for appreciation by future generations.
- In the past, many species have held the key to important discoveries, such as the cure for diseases. In the future, any species may be just as important.
- All species are connected and rely on each other to survive. Removing one species from the ecological web will have impacts on the survival of many other species.

Activity 2: Threatening processes

1. What is the meaning of **threatening process**?

2. How would you describe **habitat clearing**?

3. What is a **recovery action**? Can you give an example?

4. Why do you think it is **important to protect** threatened species and communities?

Group activity

In pairs or groups of four, design a poster to share with local community groups. On the poster include information on how to help conserve threatened species and communities. Before you get started, discuss how you can help conserve threatened species and communities in your local area.

Once you have completed the poster prepare a small talk on caring for threatened species and communities. Posters can be placed in the school library, classrooms, local shops, public libraries and on community notice boards.

Activity 3: Recovery plan

Teachers' notes

Recovery plan activity

In the first part of this activity students look at photographs and match them with the threatening processes listed to become familiar with what threats may look like.

The purpose of the next part of the activity is to give students an opportunity to research a chosen species or community and then share this information with others. It involves students researching a particular threatened species within the NAR and preparing a report.

The report is a simplified version of what is known as a 'recovery plan', used by DEC to help address the threatening processes impacting on species or communities.

The fact sheets on threatened species at the beginning of this teacher resource can be photocopied and supplied to students to help in their research.

Resources

- Threatened species and communities fact sheets
- Threat and recovery action examples
- Internet and library access

Curriculum links

Overarching outcomes: 1, 3, 5, 7, 12

Values: Social and Civic Responsibility; Environmental Responsibility

Learning area outcomes:

Society and Environment: Investigation, Communication and Participation; Place and Space; Natural and Social Systems

Science: Life and Living

English: Listening; Speaking; Reading; Writing

Evaluation

- Were students able to identify threatening processes from the pictures given?
- Were students able to identify what particular information was needed to complete the report?
- Were students able to research their chosen topic using a variety of resources?
- Could students confidently present their information to their peers?

Other activities related to this topic

- Information sessions to share with other class groups.
- Make a class book or library display with all of the reports.

Activity 3: Recovery plan

Threatening processes match-ups

Look at the pictures below and match them with their description.

One example is done for you.

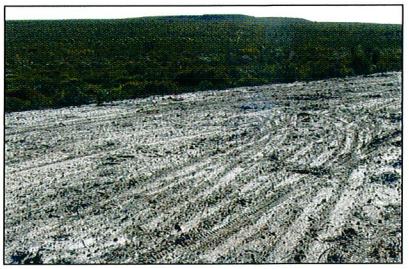
HABITAT CLEARING

PHYTOPHTHORA DIEBACK DISEASE

FIRE

INTRODUCED HERBIVORE

SALINITY



INTRODUCED PREDATOR

Activity 3: Recovery plan

Recovery plan

Imagine you are an environmental scientist or marine biologist. Your job is to research one threatened species within the Northern Agricultural Region (NAR). As a class you will then be able to create a book to share with others in your school and community.

Give yourself a title which describes your research role; for example *Flora Conservation Officer, John Citizen* or *Marine Ranger, Jane Smith*.

Your report should include the following:

1. name of the species;
2. description: include a sketch or picture;
3. location: you may like to include a map;
4. conservation status: can you explain why it has this ranking?;
5. threats;
6. recovery or management actions: this is a simple step-by-step action plan to help conserve the species; and
7. a conclusion or summary.

Kalbarri National Park.

Activity 4: Population ecology and prioritisation

Teachers' notes

Background information

Mark and recapture is a scientific method which is used worldwide to estimate species population sizes. Individuals are trapped in their natural environment, marked with a tag and released unharmed. Then, once the individuals have had time to redistribute themselves among the unmarked population, the researcher returns and captures another sample of individuals. The researcher takes note of how many individuals were captured the first visit, how many were captured the second visit and how many were captured on both visits. They can then use these figures to estimate the size of the population using the formula below. This method is known as the Lincoln-Petersen method.

$$N = \frac{(n1 \times n2)}{m}$$

Where:

N = Estimate of total population size
n1 = total number of animals captured on the first visit
n2 = total number of animals captured on second visit
m = number of animals captured on the first visit and then recaptured on second visit

Part one – outdoor hands-on activity

Set up an area outdoors where you can carry out a mark-recapture activity. Within the area, mark out a number of zones and place a random number of different objects (such as blocks, counters, shells and rocks) within each marked zone. The objects represent different fauna species.

Students can then 'trap' their objects by throwing a hoop (or similar) into the zone. They will need to count, record and mark the captured species with a sticker or tag before the objects are collected up and mixed together with some other, unmarked, objects.

Then place another random number of objects in the zones for the students to 'trap' for a second time. They should count the total number captured as well as the number recaptured (the marked objects). They can then use the formula above to calculate the estimated population size. This activity can also be carried out using match sticks in an ice-cream container. Please note a larger sample size will give a more accurate estimate.

Part two – calculations activity

Give students problems to solve relating to what they have practised in part one. Students will be required to identify what information is needed for the equation in order to estimate population size. The purpose of this activity is for students to become aware of the types of methods that researchers use when estimating the populations of species.

Categorisation activity

Species are categorised so conservation agencies can identify their likelihood of extinction and therefore determine the highest priority for management.

In this activity students decide which conservation category the threatened species should be ranked under by reading the category criteria. Refer to Table 1 on page 11. Students are given a number of scenarios to categorise from which they can make a list of threatened flora in order of priority. The information given in the scenarios is made up for the purposes of the exercise.

Resources

Clues sheet, word search, dictionary, internet

Curriculum links

Overarching outcomes: 1, 3, 7

Values: Environmental Responsibility

Learning area outcomes:

Mathematics: Appreciating Mathematics; Working Mathematically

Science: Investigating; Life and Living

Evaluation

- Could the students see how the hands-on activity related to real life research?
- Were students able to use the equation to solve the problem?
- Were students able to identify which category each flora species should be in?
- Did the students have an understanding of the processes researchers use in the real world?

Other activities related to this task

- Creating problems or scenarios for a partner to complete.
- Researching into mark-recapture and criteria for categories.

Activity 4: Population ecology

You have been given a research task to estimate population size of the following fauna species. Use the following equation to complete the problems below.

$$N = \frac{(n1 \times n2)}{m}$$

Where:
N = Estimate of total population size
n1 = total number of animals captured on the first visit
n2 = total number of animals captured on second visit
m = number of animals captured on the first visit and then recaptured on second visit

Example:

Total animals on first visit (n1): 15

Total numbers on second visit (n2): 45

Number that were recaptured on second visit from first visit (m): 15

$$N = \frac{15 \times 45}{15}$$

$$= \frac{675}{15}$$

= 45, therefore the estimated population is 45

1. A researcher aimed to find out how many dibblers were in a nature reserve in Jurien Bay. He trapped 10 dibblers on his first visit and 12 dibblers on his second visit. Of the 12 he captured on the second visit, six dibblers were recaptured from the first visit. Estimate the population size.

2. A scientist went into a study area to carry out a mark-recapture on western spiny-tailed skinks. On her first visit she captured 36 skinks. After a week she went back and caught 22 skinks. Of the 22 skinks she caught in the second visit, 12 of them were recaptured from the first visit. Estimate the population size.

3. A marine ranger went onto a local island to carry out a study of Australian sea lions. On his first visit he captured 55 sea lions. Then on his second visit he captured 30 sea lions. Of the 30 sea lions he captured, 15 were recaptured from the first visit. Estimate the population size.

4. A conservation officer went into the field to estimate the population of western brush wallabies. On her first visit she captured 300 wallabies. Then on her second visit a week later she captured 136 wallabies. Of the 136 wallabies, 120 were recaptured from the first visit. Help her estimate the population size.

5. Scientists often count the number of individuals in a population. What do you think the reason for this is?

Activity 4: Population ecology

In order to make management decisions for species and communities, each species or community is given a conservation category according to their likelihood of facing extinction. Scientists all over the world use the same criteria for categorising species and communities.

Table 2 Criteria for threatened flora categories

Conservation category	Population size reduction over last 10 years	Occurrence of population	Area of occupancy	Number of populations
Critically endangered	by 90%	less than 50 km^2	less than 5 km^2	2
Endangered	by 50%	less than 500 km^2	less than 50 km^2	5 to 10
Vulnerable	by 30%	less than 5,000 km^2	less than 500 km^2	greater than 10

Using the table above, put the following threatened species into their correct categories.

For example: *Grevillea pythara* had a population of 5,000 and it now has a population size of 2,500. It has an occurrence of 450 kilometres^2 and its occupancy is 35 kilometres^2. There are only five populations of this species. In what conservation category would this species be listed?

The population has halved so it has reduced by 50 per cent. It has an occurrence of less than 500 kilometres^2, it has an occupancy of less than 50 kilometres^2 and there are only five populations of this species. Therefore this species would be categorised as endangered.

1. The species *Acacia aprica* had a population size of 4,000 and now has a population size of 400. The number of populations is two and its area of occupancy is less than five kilometres^2. Its occurrence is less than 20 kilometres^2. What category would this species be in?

2. The species *Jacksonia pungens* has reduced in size from 1,000 to 700. Its occurrence is 3,000 kilometres^2 and area of occupancy is 400 kilometres^2. The number of populations for this species is 13. What would you categorise this species as?

3. The species *Eremophilia koobabbiensis* has reduced in size from 1,200 to 120. Its occurrence is 40 kilometres^2 and area of occupancy is four kilometres^2. It is only known from one population. What category would you put this species in?

4. Now that you have categorised these species, place them in order from most threatened (critically endangered) to least threatened (vulnerable). Include the example given.

5. **(Optional)** If you had $100,000 to spend on conserving the species above which would you spend the most on and which would you spend the least on? Why?

Activity 5: Caring for our bushland

Teachers' notes

Outdoor activity

Here the students have the opportunity to be creative and work outside. Students can work in small groups to design an imaginary area of bushland. This area should be mapped on paper to include tracks, flora, fauna and threatening processes.

Once students have created a map, they can mark out their area on the school oval or appropriate area on the school grounds. Items such as cones, markers and ropes can be used to represent the components of their designs. Students could also draw pictures of flora, fauna and threatening processes.

Students are then required to use this model to guide another group through the area, giving clues as to what they are viewing so the other group can then guess what they can see. Then they can swap roles and the other group can guide them through their area of bushland.

On returning to the classroom, students can share maps and notes on what they have been able to identify. The students can now think about the codes of practices or guidelines to follow when visiting national parks, nature reserves or local bushland. They can discuss the importance of caring for our bushland and the consequences of not having relevant codes and practices.

Bushland activity

This activity can be completed if the class has access to some bushland. It is a good opportunity for the students to look at a real situation and think about the concepts they have learnt so far. Class discussion is encouraged for students to be able to share their knowledge and learn from each other.

Resources

- Activity five sheet
- Cones, markers, ropes or similiar materials
- Paper
- Oval or similar area
- Pamphlets of national parks, available from DEC

Curriculum links

Overarching outcomes: 1, 3, 5, 7, 13

Values: Social and Civic Responsibility, Environmental Responsibility

Learning area outcomes:

Society and Environment: Investigation, Communication and Participation; Time, Continuity and Change; Natural and Social Systems; Active Citizenship

Science: Life and Living

English: Attitudes, Values and Beliefs; Reading; Listening; Writing; Speaking

Mathematics: Measurement, Space

Evaluation

- Were students able to create a map of imaginary bushland?
- Were students able to identify what was on other groups' maps?
- Were students able to develop a simple code of practice for visiting bushland in their local area?
- Were students able to identify some of the common plants and animals?
- Were students able to recognise whether species were native or introduced?

Other activities related to this task

- Excursion involving DEC staff.
- Incursion from DEC staff.

Activity 5: Caring for our bushland

Outdoor activity

Imagine you are in a national park or reserve. In groups, map out an area on paper to guide another group through the park or reserve. Your map will show areas where tracks exist, areas of flora and fauna habitat and where threatening processes are occuring. Once you have designed the map, create the area on the ground using materials to represent tracks, flora, fauna and threatening processes.

Follow the steps below:

1. Draw a map on a blank sheet of paper of the imaginary bushland that you are exploring.
2. On the map mark out tracks, threatening processes, flora and fauna.
3. Set up an area using material to represent tracks, threatening processes, flora and fauna. You can also use sketches of your own.
4. Now take another group through your area with you as the guide. Give them clues along the way to help them identify what they are seeing.
5. Swap over and have the other group guide you through their area of imaginary bushland.
6. When you return to the classroom, discuss as a whole class or in groups the flora and fauna that was seen and the threatening processes that were identified.

Creative activity

The Department of Environment and Conservation (DEC) has codes of practices to follow when you visit national parks or reserves. The following guidelines for visitors to bushland are reminders of how to **TREAD lightly**:

T – Tread and recreate with minimum impact

R – Respect the environment and the rights of others

E – Educate yourself, plan and prepare before you go

A – Allow for the future use of outdoors: leave it better than you found it

D – Discover the rewards of responsible recreation

On the back of national park information pamphlets there are also guidelines to follow. These include:

- **Stay on the road – follow signs and keep to tracks.**
- **Be careful – take care and act responsibly.**
- **Be clean – take rubbish with you when you leave.**
- **Stay cool – don't light wood fires, use portable gas stoves.**
- **Protect animals and plants – firearms and pets are not permitted in national parks.**

Now that you have read through the tread lightly code and the guidelines for national parks, have a go at developing a simple code of practice for visiting a piece of bushland in your local area.

Remember that the bushland you visit is home to many plants and animals. Think about how you like people to treat you and your home.

Your code of practice can be presented however you want. For example as a poster, song, rap, riddle, acronym or speech.

Activity 5: Caring for our bushland

Bushland activity

When you arrive at a piece of bushland, what do you notice? Do you notice the birds? Do you notice if there are trees? How tall are they? Do you notice the soil under your feet? Are there leaves on the ground?

In groups or as a class, answer the following questions about your piece of bushland:

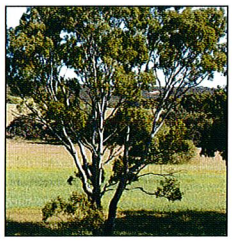
1. How many different types of plants can you see? Can you name some?

2. How many different types of animals can you see or hear? Can you name some?

Here are some examples of common plants and animals that may be found in your area.

Have you seen them in your bushland?

Native flora



eucalyptus

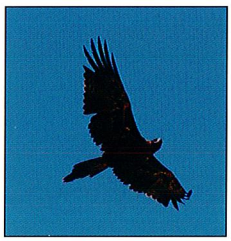
banksia

acacia (wattle)

verticordia (featherflower)

xanthorrhoea (grass tree)

Native fauna



wedge-tailed eagle

thorny devil

jewel beetle

black cockatoo

western grey kangaroo

3. Can you see any signs of animals that live in the bushland? For example, look for tracks and diggings on the ground, bites out of leaves and nests among the branches.

4 Can you see any plants or animals that look like they do not belong?

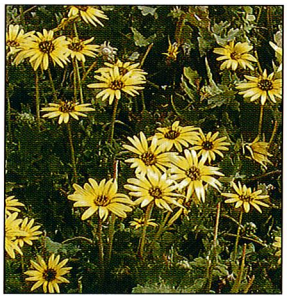
Here are some of the common weeds you may find in busland in your area:

blowfly grass
(*Briza maxima*)

introduced from the Mediterranean

gladiolus
(*Gladiolus* species)

introduced from Africa and the Mediterranean



cape weed
(*Arctotheca calendula*)

introduced from South Africa

Victorian tea tree
(*Leptospermum laevigatum*)

introduced from Victoria

5 Can you see anything that could be causing a problem for the health of the bushland?

6 If you have identified some threatening processes, what recovery actions might you take to combat them?

Extension activities

Additional activities could include:

English

Word search – students can develop their own word search to give to a partner

Secret messages – teachers or students can create messages for others to decode on threatened species or communities

Health and Physical Activity

Bush walking

The Arts

Drawings or sketches of plants or animals

Flower pressing using flowers from the garden

Mathematics

Using samples to estimate population sizes

LOTE

Research into scientific names of flora and fauna species (Latin and their meanings)

Society and Environment

Incursion: Have someone from your local DEC district office come into your class and give an informative talk. This can include information, activities and games and will give students the opportunity to ask questions. The officer can bring in pictures, animals, traps, plant presses, microscopes and reference material.

Excursion: (It is recommended that these activities involve a DEC officer.)

- Organise to visit bushland in your local area. Teachers can contact DEC offices to access maps of the bushland in your area and information about its natural values.
- Set up quadrats and transect lines to survey for native species in a piece of remnant vegetation near the school.
- Count how many weed species there are in bushland areas.
- During spring, organise an excursion to a national park near the school and go for a walk through the bush to see the variety of species in the area.
- Take a boat trip to an island to learn about animals such as Australian sea lions and Lancelin Island skinks.

Science

Labeling plants and animals

Using scientific methods and writing scientific reports

Food webs

Life cycles

Technology and Enterprise

Design an ecological community and show the connections between all species.

Design a board game to help others learn about threatened species and communities.

Develop a mind map on threatened species and communities. This process can be started from the beginning of the package and students can add to it as they learn more about the topic. The mind map can be used as an evaluation tool to see what students have learnt about this particular topic.

Other resources and useful links

Teachers' notes

Websites:

Department of Environment and Conservation:
www.dec.wa.gov.au

Department of the Environment, Water, Heritage and the Arts - biodiversity page:
www.biodiversity.environment.gov.au

Northern Agricultural Catchments Council
www.nacc.com.au

Kwongan Connections
www.nacc.com.au/kwongan

Resource books:

Annandale, K; Bindon, R; Broz, J; Handley, K; Johnston, A; Lockett, L; Lynch, P; Rourke, R. 2005. *First Steps (2nd Edition) Writing Map of Development*, Rigby Heinemann - Harcourt Education, Victoria.

Department of Conservation and Land Management, 1998. Western Australia's *Threatened Flora*. Department of Conservation and Land Management, Western Australia.

Department of Conservation and Land Management, 2004. *Threatened Animals of Western Australia*. Department of Conservation and Land Management, Western Australia.

Department of Environment and Conservation, 2007. *Back from the Brink Activity Book*

Murdoch, K. 1998. *Classroom Connections: Strategies for Integrated Learning*. Eleanor Curtain Publishing, Victoria.

The Murchison River.

Back from the Brink

For more information on this and other resources, please contact:

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