

Chapter 7 Ecosystem changes and conservation strategies for biodiversity

Question set 7.1

Remembering

- 1 A healthy ecosystem can sustain stress in the form of extreme conditions such as floods, droughts, invasive species, disease and overexploitation; it shows resilience.
- 2 Wetlands are neither aquatic nor terrestrial but exist in the meeting of these two, changing seasonally to become more or less of each type of ecosystem.

Understanding

- 3 Human population increased → Land cleared for housing (urbanisation) → Land cleared for agriculture → Areas of land assigned to landfill → Loss of 90% of wetlands

Question set 7.2

Remembering

- 1 Urbanisation is the extreme modification of an ecosystem by humans to support a human population of gradually increasing density. Urban ecosystems have reduced biodiversity and are dominated by people. There is little recycling of matter between the community (the living things present) and the non-living surroundings. Additional inputs of energy and matter are needed from other ecosystems to maintain modern standards of living. There is an increase in output of gaseous and material wastes of many kinds, and these are disposed of into our atmosphere, onto the land and into the water of other ecosystems, which in turn are also altered. Urbanisation can cause rapid changes of large magnitude to an ecosystem. Local biodiversity is reduced and, even though new species may potentially move into an urban area, the ecosystem is changed for a very long time, often permanently.
- 2 Habitat fragmentation happens when some of the habitat of an ecosystem is separated into isolated sections. This can be a result of habitat destruction for land clearing for agriculture, roads or urbanisation.
- 3 Along with many other species, the Carnaby's black cockatoo has been affected by the millions of hectares of habitat around Australia destroyed in the last 20 years. Agriculture is the main reason for the land clearing, followed by native-forest logging, urban development, and mining. The Carnaby's black cockatoo has lost thousands of hectares of habitat which has led to a great decline in the number of birds.
- 4 The Gondwana Link project was set up to reverse the habitat destruction and fragmentation from European colonisation. Actions to reduce the effects of habitat fragmentation include revegetation of areas previously cleared to connect various ecosystems, the eradication of introduced and feral species, and the protection of these areas to allow endemic species to repopulate of these areas.

Understanding

- 5 Due to human population growth, land cleared for agriculture → Deep-rooted native perennial trees replaced with shallow-rooted annual crops → Crop plant roots do not reach water table, water level starts to rise because transpiration has ceased → As water table rises, salt from surrounding soil dissolves into the water and rises with it → The salty water rises to the surface of the land → The water evaporates → Plants can't grow because of the salt concentration in the soil

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Strategy type	Example
Genetic	As part of a risk management strategy for WA's threatened flora, certain species are stored in seed banks at the WA Seed Centre and the Threatened Flora Seed Centre. The aim of the Threatened Flora Seed Centre is to have enough genetic resources from each threatened species to be able to re-establish it in the wild if it becomes extinct. The centre stores more than 5000 collections, with priority given to seeds of species with low plant numbers, few populations and small geographic ranges, and that are genetically or taxonomically distinct and endemic (local WA plants).
Environmental	Regeneration of land and bush corridors between isolated habitats can be an effective way of returning habitat to populations and enabling subpopulations to interbreed. The Gondwana Link is an environmental strategy that has been working to reconnect bushland across the south-west of Australia since 2002.
Management	Gondwana Link has also worked on a set of restoration standards, which have been picked up for use in national standards. They provide guidance on how to design and implement revegetation for ecological restoration in such a way that the best possible ecological outcomes are achieved. The standards are particularly applicable to any project aimed at restoration of native systems.

Question set 7.3

Understanding

- 1 **a** When environmental conditions change and favour a rapid increase in numbers of a species at the expense of others, that species can become a pest.
- b** Advantage: rapid control
Disadvantages: accumulation of chemicals, perhaps non-biodegradable; species other than the target species may be affected.
- 2 Introduced species are species that humans have intentionally or unintentionally moved from their native location to a new ecological region, where they are without the natural predators, parasites and pathogens that would have limited their growth. Introduced species become invasive species if they manage to establish populations in new areas.

Analysing

3	Method of biological control (agents)	Examples
	Virus	Myxomatosis, rabbit haemorrhagic disease virus and calicivirus have all been used to control rabbits, an agricultural pest
	Specialised predators	Weevils to control water weeds Moths and flea beetles to control alligator weed Beetle to control water hyacinth etc.
	Parasites	Wasps and stem-girdler moths Nematodes and <i>Sirex</i> infestations of softwood plantations
	Microbial diseases	Myco-insecticides (fungal) and grubs

Evaluating

- 4 Cane toads outcompete native species for both food and habitat. They are toxic at all stages of their lifecycle, from eggs to tadpoles to adults. Their toxin is strong enough to kill most native animals that prey on them, such as birds, frogs, reptiles and mammals.
- They are without the natural predators, parasites and pathogens that would have limited their growth.

Question set 7.4

Understanding

- 1 a If organisms such as fish are overharvested, this means they are harvested at rates that exceed the replenishment rate of the population.
- 2 A fishing licence is a paid certificate or statement from the state government giving you permission to fish for a specific fish species. Permission is usually seasonal to allow a period in which the fish can reproduce. Licences are one method for ensuring fishing is sustainable.

Evaluating

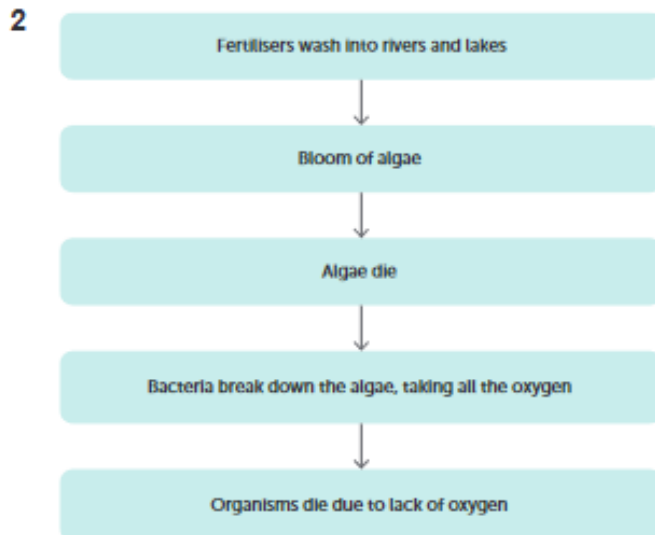
- 3 Bottom trawling involves dragging a large net across the seafloor, and is the most destructive form of fishing for our oceans. Deep-sea fish species are targeted globally by bottom trawling. Bottom trawling removes vast amounts of non-target species, including habitat-forming deep-sea corals and sponges. Therefore, bottom trawling poses a serious risk to deep-sea ecosystems.

Question set 7.5

Remembering

- 1 Eutrophication is a process that occurs when excess nutrients, particularly nitrogen and phosphorus, enter a body of water and become highly concentrated, leading to excess growth of organisms such as algae.

Understanding



Evaluating

- 3 Students' own responses.

Question set 7.6

Remembering

- 1 Fossil fuels are natural energy sources, such as coal, oil and natural gas, containing hydrocarbons. Fossil fuels are formed from fossilised living things, usually in sedimentary rock, over millions of years and produce carbon dioxide when burned.

Understanding

- 2 Both climate and weather describe the same atmospheric factors, such as temperature, precipitation, wind and sunlight intensity. Climate is the average long-term, predictable atmospheric weather conditions at a site over a period ranging from months to many thousands of years. In contrast, weather is the atmospheric conditions in an area over a short time, usually 2–3 days. Weather forecasts or predictions can be very unreliable.
- 3 The climate includes abiotic factors such as temperature. Organisms are sensitive to climate factors and any change may cause organisms in the ecosystem's community to migrate to a higher altitude or another habitat, where the temperature suits them and there is plentiful shelter or food. Animals and plants will only grow and survive in places where they can fulfil their niche.
- 4 Global warming refers only to Earth's rising average surface temperature, while climate change includes warming and the 'side effects' of warming, such as extreme weather events, heavier rainstorms and more frequent drought.

Analysing

- 5 The current increases in atmospheric carbon dioxide have happened very quickly – in a matter of hundreds, rather than thousands, of years. The magnitude of the increase in the rate of atmospheric carbon dioxide is different from past rises. It took around 50 000 years for the

atmospheric carbon dioxide level to increase from its low minimum concentration to its higher maximum concentration. However, beginning only a few centuries ago, atmospheric carbon dioxide concentrations have increased beyond the historical maximum of 400 ppm.

- 6 Students' own diagrams – see Figure 7.28 on page 221 of the student book.
- 7 The greenhouse effect is the natural effect of atmospheric greenhouse gases absorbing and retaining some heat in our atmosphere. It is needed for life on Earth. The enhanced greenhouse gas is the retention of extra heat as the levels of greenhouse gases in the atmosphere rise as a result of human activity. The enhanced greenhouse effect is causing global warming and is a threat to life and biodiversity.

Chapter review questions

Remembering

- 1 Deforestation is the permanent removal of standing forests.
- 2 Cane toads have spread across the savanna in northern Australia and are a threat to our biodiversity. They compete with native species for both food and habitat. They are toxic at all stages of their lifecycle, from eggs to tadpoles to adults. Their toxin is strong enough to kill most native animals that prey on them or their eggs, such as birds, frogs, reptiles and mammals. Their toxicity means they pose a threat to pets such as dogs and cats. Their appetite means they eat large quantities of insects. They also eat native frogs, small mammals and even snakes.
- 3 To be a biodiversity hotspot, regions must be both rich in biodiversity that is found nowhere else in the world (having at least 1500 endemic vascular plant species) and be at a high risk of destruction and extinction (having 30% or less of its original natural vegetation).
- 4 Turn lights and standby lights off, open windows instead of turning on air-conditioner, use 'keep cups' instead of throw-away coffee cups (fossil fuels are used to manufacture these).
- 5 Species that cannot survive the changes in climate may become extinct. Currently, extinction of a species is irreversible.
- 6 By establishing World Heritage sites, UNESCO aims to identify, protect and preserve locations of cultural and natural heritage around the world that are considered to be of outstanding value to humanity.
- 7 Greenhouse gases absorb some of the long-wave radiation (heat) and trap it in Earth's atmosphere instead of allowing it all to radiate out of Earth's atmosphere and into space.
- 8 Carbon dioxide cycles around in matter and exists in the atmosphere as a gas. In this form it acts as a greenhouse gas. Forests are carbon sinks, because they absorb carbon dioxide gas for photosynthesis. The removal of forests (deforestation) increases the percentage of carbon dioxide in the atmosphere.

Applying

- 9 $0.3 \times 9.5 \times 9.5 = 27.075$ ppm
- 10 An algal bloom is a rapid increase in the population of algae or other micro-organisms (such as cyanobacteria), at the surface of a water body, that blocks sunlight from entering. When this happens, autotrophs that live under the surface die. Algae then die and are decomposed by bacteria. As bacteria consume the dead algae, they use large amounts of oxygen from the water, which depletes oxygen levels. The water body can become hypoxic (low in oxygen)

and possibly anoxic (completely devoid of oxygen). The low oxygen levels do not meet the respiration needs of aquatic organisms, so fish and other populations die, and eventually there is degradation of the ecosystem.

- 11** Farmers, manufacturers, mining companies and transportation providers (trains/buses) must make profits and their businesses currently rely on the burning of fossil fuels. To switch to an alternative energy source, they need to take some financial risks and even lose money in the short term (short-term pain). This would reduce greenhouse gases. If an alternative energy source can provide enough energy to sustain their production or service and their profit, then in the long term, the planet's ecosystems will remain healthy, biodiversity can be maintained and when fossil fuels run out, the business will continue to make money. In fact, they might increase their revenue if other companies became non-viable due to a shortage in fossil fuels.
- 12** Zones have been set up around migrating whales to ensure that whales are not disturbed and separated from their pod. Interaction conditions are enforced for each of these zones. In the approach zone, within 300 m from the whales, the boat must approach with caution. Only one boat is allowed in the exclusive contact zone, between 50 and 100 m of the whales and it is limited to remaining in this zone for 1 hour. Boat speed is also reduced to 8 knots. Boats are not allowed to enter the no approach zone around the whales to minimise disturbance to the whales.

Creating

- 13** Students' answers will vary.
- 14 a** Rapid response is an advantage of spraying chemicals. The potential for the accumulation of toxic chemicals/pesticides is a disadvantage.
- b** Winemakers are using the *Trichogramma* wasp as a specialised predator to control the population of apple moths. This is a form of biological control.
- c** This will depend on students' responses.

Reflecting

- 15** Responses will vary.
- 16** Responses will vary.
- 17** Responses will vary.

Practice exam questions

- 1** A
- 2** D
- 3 a** A species that humans have intentionally or unintentionally moved from the introduced species' native location to a new ecological region (1 mark), and that has established a population in the new area (1 mark).
- b** Biological control is when another organism is used to control the population of a pest species (1 mark). Risks include (two out of the following or any reasonable risk):
- the biological control becomes a pest
 - the biological control becomes uncontrollable
 - it doesn't target the one species
 - it carries disease.

4 This is eutrophication. (1 mark)

It is caused by: (1 mark each)

- rainfall/irrigation leads to run-off from the land
- which contains excess nutrients or fertiliser, especially nitrogen and phosphorous
- which leads to increased productivity/algal growth.

5 Dryland salinity is the increase of salt in the soil.

Causes: (5 marks)

- the removal of deep-rooted trees
- replacement by shallow-rooted annual crops
- roots can't reach the water table
- reducing transpiration
- reduced transpiration causes the water table to rise
- salts from surrounding soil are dissolved and carried up as water it rises.

Effects: (4 marks)

- the water table reaches the soil surface
- water evaporates from surface
- salt concentrates at the surface
- salt makes soil infertile
- soil becomes unsuitable for farm crops.

6 Students' answers will vary.