Such Resilience!
Instructions and Answers for Teachers

- Venue: Flower Dome (indoor)
- Estimated duration to complete all questions: 1 hr

Level / Subject:

- Lower Secondary (Science): Interactions within ecosystems

Learning Objectives:

- Recognise how adaptive traits (structural or behavioural) and changes to environmental conditions can affect the survival of organisms

Activity 1: The Power of Resilience (20 min)

Plants can be very resilient. Some have adaptive traits (structural or behavioural) that enable them to survive the changes in environmental conditions.

(a) What are some environmental conditions that will affect the survival of a plant? Discuss with a partner and list them here.

Answers: Change in amount of light; change in environmental temperature; change in amount of soil nutrients; change in pH of soil / water; natural disasters such as flood / drought, wild bushfire, strong winds (e.g. typhoon), etc.

(b) There is a plant at the Australian Garden (Flower Dome) that has a charred appearance. It looks very much like grass but with a "trunk". What is its common name?

Answer: Grass Tree.

(c) The plant identified in (b) often encounters a natural disaster in its habitat. State what it is and describe how the plant is able to adapt to these conditions.

Natural Disaster	Answers: Wild bushfires.
Adaptation(s)	Answers: Grass Trees grow on drier soils that often encounter natural wild bushfires in their habitat in Australia. Natural fires are caused by

	very high temperature and very dry air during the hot and scorched seasons. Some species of Grass Trees are resistant to fire. The trunk-like structure is made up of old leaf bases and resin that protect the growing crown and buds from fire. The plant is also stimulated to flower after a fire.

Activity 2: Adapted to Fire (20 min)

(a) There is another plant at the Mediterranean Garden (Flower Dome) that has a thick and rough bark that enables it to survive wild fires. What is its common name?

Answer: Cork Oak Tree

(b) Describe the plant's adaptation(s) and list its uses.

Adaptation(s)	Answers: Its thick bark contains a high amount of suberin which is a waxy, waterproof substance in its cell walls. This protects the dormant buds beneath from frequent fires that occur in its natural habitat. After a fire, the tree is able to recover better than other plants as its bark will regenerate with less effort and its protected buds are stimulated to sprout.
Uses	Answers: The high amount of suberin in its bark makes it a waterproof material and a very good insulator. Its bark is made into wine bottle stoppers, notice boards and even fire-proof doors and walls.

Group Activity: Overcoming the Odds (20 min)

From the examples covered in this activity sheet, it is clear that these plants are able to make the best of a disaster and overcome it through regrowth.

Think about Singapore. Identify a time of tribulation (relating to the economy, security or resources, disasters, etc.) that the country had to endure. How did Singapore overcome this period of difficulty?

Discuss in your groups and describe it in the table below.

Problem	Example answer: SARS outbreak in 2003
Singapore's Solution(s) (action plans and procedures)	Example answers: - Tracing the chain of contact of the patients and healthcare workers. - Quarantining patients, medical workers and those who had close contact with patients, and closure of schools and workplaces to prevent spread. - Screening of incoming travellers at immigration checkpoints and patients and visitors at hospitals. - Nation-wide distribution of thermometers and public education on symptoms, and preventive measures such as the importance of personal hygiene e.g. washing hands and social responsibility e.g. self-quarantine, wearing a mask to prevent spread, etc. - Nation-wide education on early detection by encouraging / enforcing daily monitoring of temperature and symptoms at schools and workplaces. - Designated healthcare facilities (Tan Tock Seng Hospital and CDC, dedicated ambulances) were assigned for isolating and treating cases.
Outcomes (effects, impact and future)	Example answers: - The outbreak was brought under control and the spread was contained. This prevented the number of casualties from increasing. - Singaporeans were educated on the importance of personal hygiene, social responsibility and other preventive measures. - Singapore is now more prepared to handle similar outbreaks in future. - Certain industries were affected economically e.g. hotels, public transport, restaurants, retail shops, airlines and travel agencies as people stayed at home more and travelled less. - Singaporeans demonstrated their unity and community spirit by volunteering and offering a helping hand to others.

Given above is an example of possible answers. Other answers are acceptable if students provide well thought-out reasoning. Teachers may also share plausible answers for the purpose of general knowledge.

Notes to Teacher:

For more plants that have adapted to their environment, check out these Secondary School programmes:

- Gardens Under Glass,
- The COOL Factor,
- Upsized,
- Clinging On,
- Barbed and Bloated,
- Protecting Our Green Gems

Please refer to our website for more details.