Topic 1.6
How can our actions promote sustainable ecosystems?

Overview

In this topic, students will examine the concept of sustainability and the links between sustainability and biodiversity. Students will investigate examples of ways human activities can rebuild, maintain, and benefit ecosystems.

Common Misconceptions

- **Students may presume that at equilibrium, a high degree of biodiversity means that an ecosystem is sustainable.** However, the sustainability of an ecosystem relates to the biotic and abiotic components of the ecosystem and is not related only to biodiversity. Biodiversity can decrease rapidly if biotic and abiotic needs are not met.
- **Some students may say that Earth Hour is simply a media stunt.** Review the Earth Hour data on page 63 to show that Earth Hour makes an important point about power consumption. Unless we take action very soon, these small steps will no longer be useful because we will not be around. While Earth Hour may or may not result in an immediate decrease in energy use, the results show it definitely has been successful at getting people to think about reducing consumption, which will produce long-term changes.
- **Students may believe that smart growth only works in large urban centres.** Remind students that large urban centres were once small towns and villages, and all communities can benefit from this strategy as they develop.

Background Knowledge

Students must understand and make a firm commitment to sustainability and recognize their role as stewards for the environment. As teachers, we have an even larger responsibility. We must lead by example and by explaining to students both the how and the why of such a commitment. Biodiversity describes the variety and abundance of the species present in an ecosystem. Currently human activities are threatening that biodiversity and many species are classified as extirpated, endangered, threatened, or even possibly extinct. The future of our planet demands that we all accept responsibility for our actions and become stewards of our environment. Everyday choices in our communities can make them more sustainable and environmentally friendly. Alternative strategies must be instituted to reduce the negative impacts of our previous activities. The 100 km diet, organic farming, integrated pest management, sustainable forestry, and new construction techniques all represent steps in the right direction. Businesses that have in the past shirked any environmental responsibility must begin to accept their role as stewards of the environment as well. Canadians must reduce the impact of their ecological footprint to well below 8.9 ha of land per person and adopt the lifestyle that will allow such a reduction, if we are to enjoy a sustainable future.

May 22nd of each year has been declared the International Day of Biodiversity.

Specific Expectations

- **B1.2** assess the effectiveness of a local initiative of personal interest that seeks to ensure the sustainability of a terrestrial or aquatic ecosystem, and explain why the initiative is important to the sustainability of the ecosystem
- **B2.1** use appropriate terminology related to sustainable ecosystems and human activity, including, but not limited to: biodiversity, biotic, ecosystem, equilibrium, species diversity, sustainability, and watershed
- **B2.2** investigate the characteristics and interactions of biotic and abiotic components of a terrestrial or aquatic ecosystem, and describe the importance of these components in a sustainable ecosystem
- **B2.4** plan and conduct an inquiry into how a factor related to human activity affects a terrestrial or aquatic ecosystem, and describe the consequences that this factor has for the sustainability of the ecosystem
- **B2.5** analyze the effect of factors related to human activity on terrestrial or aquatic ecosystems by interpreting data and generating graphs
- **B3.5** identify some factors related to human activity that have an impact on ecosystems, and explain how these factors affect the equilibrium and survival of populations in terrestrial and aquatic ecosystems

Skills

- identify and locate relevant resources
- communicate conclusions in a variety of formats

Materials

Please see the teaching notes for each activity for a list of the materials required. Please see page TR-38 for a summary of the materials required in this topic.

Literacy Strategies

Before Reading

- Ask students to define the Key Terms based upon their prior knowledge.
- Read the topic title to the students. Together, brainstorm a list of possible answers. You can use a Concept Map or a Fishbone Diagram (Student textbook page 393) to organize the responses.

During Reading

- Have students use a Predict-Read-Verify strategy as they read the text. Students should combine prior knowledge with the headings and the opening sentences to predict what each spread will be about. Break text into manageable chunks for students to synthesize and have them verify their predictions as they read.
- Model for students how to use the Learning Check questions on each spread to decide if you need to reread anything or ask for clarification.
- In the final spread on pages 70–71, have students answer the questions along each photo to explain how their actions may promote sustainability. They can use Think-Pair-Share for these questions.

After Reading

- Have students use graphic organizers such as a Concept Map (**BLM G-33 Concept Map**) or Flowchart (**BLM G-34 Flowchart**) to summarize how biodiversity can be affected by human interventions.
- Ask students to reflect on the role of human activities and sustainability. Have them make a list of human activities using words or diagrams, then arrange the activities along a rating scale from –10 (very negative environmental impact) to +10 (very positive environmental impact). The list could be generated by the whole class or by groups. Students could work in groups to organize the activities on the rating scale.

Assessment FOR Learning

Tool	Evidence of Student Understanding	Interventions
Learning Check, questions 1 and 2, page 66 Activity 1.17, page 67	Students describe the importance of biodiversity and balance in a sustainable ecosystem.	• Have students describe what would happen if an ecosystem were not in balance. • Create concept maps with students to explore the full meanings of the terms sustainable, biodiversity, and equilibrium.
Learning Check, page 69	Students identify some factors related to human activity that affect the equilibrium of an ecosystems.	• Have students use a T-chart to classify positive and negative effects of common human activities on ecosystems. • Have students use a flowchart to show how a factor that affects one species can have an effect on the entire ecosystem. • Use examples of ecosystems from the text, such as the two in Activity 1.17 on page 67. • Allow students to use diagrams in their answers, where appropriate.
Investigation 1D, page 76	Students assess a local initiative and its contribution to the sustainability of an ecosystem.	• Help groups to break down the research tasks so that everyone in the group has a meaningful role to play. • Make **BLMs G-14 Research Worksheet** available to students to help them organize their research and **BLM G-32 Cause and Effect Map** to help with What Did You Find Out? question 1.

Topic 1.6 (Student textbook pages 62–77)

Using the Topic Opener (Student textbook pages 62-63)

- Try to obtain current Earth Hour data for your community or for a neighbouring community. Have students compare the results for their region with other Ontario regions. If possible, provide data from multiple years to determine how regions are performing on Earth Hour over time.
- After reading page 62, invite students to share what they or their families have done to mark Earth Hour.
- Earth Hour is only one initiative designed to raise global awareness about environmental issues. Introduce the The Green Wave, an international program dedicated to raising awareness about biodiversity, and determine how the students might take part in this initiative. The International Day of Biodiversity is May 22nd. Each year features a theme such as Invasive Alien Species or Protecting Biodiversity in Drylands. Have students devise activities to go along with each theme, or plan an event to take place on the next International Day of Biodiversity. Students can also research other initiatives dedicated to protecting biodiversity, including simple local projects such as volunteering to clean up a local area that might require rehabilitation.

Starting Point Activity

Pedagogical Purpose

Students will examine Earth Hour data for selected cities in Ontario and analyze each city's effectiveness. They will also determine methods to reduce energy consumption in both the home and in the community.

Planning	
Materials	none
Time	15 min in class 10 min preparation (Obtain current Earth Hour data for your local community)

Activity Notes and Troubleshooting

- Ask students if having an annual Earth Hour is enough. They may discuss the frequency and duration of these events, as well as any difficulties in organizing or advertising.
- For question 2, encourage students to think of all the electrical items they have at home that are plugged in even when they are not in use. Some of these items are still consuming electricity because they are in a standby mode.
- Ask students how they can promote the concepts behind Earth Hour in their school, home, and community.
- Some electricity providers charge different rates for electricity depending on the time of day, with higher rates when the load is greater. Ask students how knowing this might affect their electrical usage.

Additional Support

- Enrichment—Some students may be interested in researching the power used by electronics while in standby mode. Have them look up information on "standby power" or "phantom load" as it is sometimes known.
- Enrichment—Have students investigate some creative Earth Hour activities in Canada and around the world and report back to the class.

- ELL Tell students that each paragraph on page 62 describes Earth Hour in a different year. Have students summarize each paragraph by listing the year, number of cities participating, and any significant results. They can work on their own or with a classmate.

Answers

1. Answers may vary. For websites with sample Earth Hour data, go to **www.scienceontario.ca**.
2. To conserve energy, computers, televisions, battery chargers, non-essential lights, and heating systems could be turned off.
3. **a)** The event could have had a greater effect with more publicity in both schools and communities and through different municipalities challenging each other.
   b) The event might show the general populations how small changes in energy conservation may make huge savings in energy use. It also brings more publicity to climate change.

Instructional Strategies for Topic 1.6

We must understand and commit to sustainability. (Student textbook pages 64–65)

- Have students construct a Picture Glossary using key terms as they are introduced. Recommendations for creating a Picture Glossary can be found in the Unit 1 Review, question 4 on page 84.
- Review the matter cycles from Topic 1.3 with students. Ask how these cycles relate to the idea of sustainability.
- Use specific examples to demonstrate the idea of sustainability. For example, mining and using up all the coal in a region is not an example of sustainability because coal formation takes millions of years. Alternatively, windmills and waterwheels are methods of getting energy that do not affect the sustainability of an ecosystem because they do not take anything away from the ecosystem.
- To help students understand sustainability, discuss its opposite. Have them describe examples of human activities that would destroy the sustainability of an ecosystem, such as polluting, draining a body of water, clear-cutting a forest, or wiping out an animal species. Have students hypothesize about the future of that ecosystem.

We must understand the link between biodiversity and sustainability.
(Student textbook pages 66–67)

- Review the idea of species diversity from Topic 1.5.
- Use a diagram or pictures from the textbook to help explain the concept of biodiversity. For example, the diagram on page 8 shows some of the diversity of life that lives in and on human beings. The illustration on page 14 shows the diversity of life in a pond ecosystem even in winter. Ask students for an example of an area that was not diverse. They school front lawn or a golf course might be a good example.
- DI Have linguistic learners compare the words equilibrium and balance.
- Have students consider the pictures in Activity 1.17 on page 67 to imagine how a low degree of biodiversity might endanger an ecosystem. If they are having difficulty, ask them to imagine a disease wiping out one of the species in each picture. They should realize that the equilibrium is more delicate in an ecosystem with a low degree of biodiversity because the loss of one species would greatly impact the few other species.
- Enrichment—Have students research *The Green Wave*, a global campaign educating people about biodiversity by the Convention on Biological Diversity.

Our actions can maintain or rebuild sustainable ecosystems.
(Student textbook pages 68–69)

- Have students take turns reading each caption aloud. Pause after each one to discuss the benefits and any possible consequences of each initiative. For example, the beetle in the third image is an introduced species; ask students what decisions should have been made before it was brought to North America.
- Ask students to describe examples of nature reserves that they know of or have visited.
- Have students use **BLM G-33 Concept Map** to summarize how their own actions may have an impact on a local ecosystem.
- Use **BLM 1-25 Examining Sustainability** as a way to link to the ideas in Topic 1.5, the ways human activities affect ecosystems, with ways of maintaining or rebuilding sustainable ecosystems.
- ELL To support English language learners, and to build students' summarizing skills, work together to summarize each caption as a headline.
- This spread is related to Activity 1.18 on page 73 and the Case Study Investigation on page 76. Either continue directly to those activities, or refer back to this spread while working on those activities.

You can choose actions that benefit ecosystems now and for the future.
(Student textbook pages 70–71)

- Have students take turns reading each caption. Pause after each one to answer the questions it raises. Have students think about their own answers, discuss with a classmate for one or two minutes, then share with the class.
- Have students choose an ordinary event in their day such as brushing their teeth or washing dishes, and think about ways this event might affect near or distant ecosystems and simple changes that would reduce any negative impact. For example, reducing the water they use, choosing cold water instead of using gas or electricity to heat water, and reusing water where possible, such as for watering plants.
- Have students return to the Unit Opener on pages 2–3 to answer the question about the person in the photo using what they have learned in this Unit.
- Invite an environmental activist to speak to class about their role as stewards for the environment.
- Enrichment—Have students complete a grade-wide poll to learn how other students are making changes in society by acting as informed consumers, as activists, or as volunteers.

Learning Check Answers (Student textbook page 64)

1. Sustainability means maintaining an ecosystem so that present populations can get the resources they need without risking the ability of future generations to get the resources that they will need.
2. Clean drinking water, fuels such as oil, coal, and natural gas, food, oxygen and other nutrients, and shelter.
3. Answers may vary. For example, find more renewable sources of energy and reduce the amount of fossil fuels so there will be some left for future generations, using water efficiently, recycling, and planting trees.
4. Answers may vary. For example, riding a bike or walking instead of getting a car ride (sustainable), recycling and composting (sustainable), and using electricity (unsustainable).

Activity 1.16 Reflecting on Responsibilities (Student textbook page 65)

Pedagogical Purpose

In this activity, students will read an Aboriginal passage that provides them with an opportunity to reflect upon their role is sustaining their local ecosystem as well as the larger system of ecosystems on Earth.

Planning	
Materials	None required
Time	15 min in class 0 min preparation

Background Knowledge

The Haudenosaunee, or Iroquois, are a confederation of six First Nations who have lived in what is now upstate New York and parts of southern Ontario and Québec for centuries.

Activity Notes and Troubleshooting

- Students are exposed to a message that is traditional in some societies but not in others, and asked to contemplate and reconsider their individual role and appreciate the concepts of sustainability and biodiversity.
- Have students take turns reading small sections of the passage. Consider reading the fourth paragraph yourself since it acknowledges the youth who will be the future stewards of the Earth.
- Provide opportunities to reflect on each section of the passage. Students can share their reflections with their peers, in small groups, through a class discussion, or in a creative activity.
- Connect the ideas in the passage to the definition of sustainability on page 64.

Additional Support

- Allow quiet time for reflection; soft music might help.
- DI Student reflections on the passage could include diagrams, songs, symbols, and other poetry.
- ELL Have students summarize each statement from the passage in a few words. Clarify culture references such as calling the Earth "our sacred Mother" for English language learners.
- Encourage students to share any words in support of sustainability from other cultures that they are aware of.

Activity 1.16 Answers

Answers will vary. Students should be able to link the idea of sustainability with caring for the planet so that future generations can live a life as good as that of current generations.

Learning Check Answers (Student textbook page 66)

1. Biodiversity can refer to species as well as ecosystems because of all the different species present in any ecosystem are in turn connected to many other ecosystems.
2. Equilibrium is the state of balance that a sustainable ecosystem must maintain and an ecosystem at equilibrium tends to have a high degree of biodiversity.
3. Answers may vary. Diagrams should show a variety of plants, animals, and abiotic components all in balance to represent biodiversity and equilibrium.

Activity 1.17 Look for the Links (Student textbook page 67)

Pedagogical Purpose

Students compare a forest ecosystem and an Arctic ecosystem, then observe human activities that are helping ecosystems to maintain equilibrium.

Planning	
Materials	**BLM 1-26 Activity 1.17 Comparisons** (optional)
Time	30 min in class 5 min preparation (prepare copies of BLM)

Background Knowledge

The biodiversity of an ecosystem is directly related to the number and variety of links among species. No matter how much biodiversity there is in an ecosystem, a sustainable ecosystem must maintain a state of balance between its biotic and abiotic components.

Activity Notes and Troubleshooting

- Refer students to the introduction of food webs in Topic 1.2 on page 23 as a refresher. This activity could also be used as a quick reminder of terms such as producer, consumer, and decomposer, or of the energy flow in an ecosystem.
- These diagrams contain more information than food webs because they also include decomposers.
- In this activity, students are asked to compare both quantitative and qualitative characteristics. Distribute copies of **BLM 1-26 Activity 1.17 Comparisons** for students to use to organize their answers to the first two questions.
- Students can work individually or in small groups to answer the questions.
- Review students' responses in this activity to make sure students understand the scope of the term biodiversity and its importance in ecosystems.

Additional Support

- Have students share their comparisons and solutions with the class to broaden everyone's understanding.
- To help focus the activity, you may choose not to have students record on the BLM, and instead, to lead a class discussion about each question and have students contribute to a graphic organizer on the chalkboard.
- ELL Use or allow point form notes for comparisons.
- Enrichment—Have students discuss the types of activities that might help ecosystems maintain equilibrium. Have them also discuss what could upset the equilibrium in the given ecosystems.

Activity 1.17 Answers

1.

Forest Ecosystem	Abiotic Components	Arctic Ecosystem
high	Amount of sunlight	low
warm	Temperature	cool
warm	Water	cool
unlimited	Shelter	limited

2. Biodiversity is higher in the forest ecosystem because more abiotic components allow the ecosystem to maintain a greater number of species.
3. Equilibrium refers to sustainability but does not require a high degree of biodiversity. The equilibrium in the rainforest should also be more stable than that of the desert.

Learning Check Answers (Student textbook page 69)

1. Answers may vary. For example: creating nature reserves to keep out industry and using biocontrol to limit the population of dangerous introduced species.
2. The land is already used for buildings, so no new land is being paved.
3. The introduced species may have a negative effect on local species that it competes with. It may have fewer limiting factors and take over.

Using Making a Difference

Literacy Support

Before Reading

- Remind students of the previous Making a Difference feature at the end of Topic 1.5.
- Discuss the state of recycling at your school before reading the first section. Does the school separate out all the materials that the municipality can recycle? Is there a compost or wet-waste program?

During Reading

- As students read the first section, have them compare Yvonne's school's situation with their own.
- As students read the second section, ask students what parallels they see between the actions of these students and those on pages 68 and 69. Students should recognize the preserving and restoring of an ecosystem, the reintroduction of native species, and making new homes (nest boxes versus a hatchery).

After Reading

- Have students identify the human activity and its effect that the students in each section are trying to offset.
- Ask students how they could use or modify the ideas presented here in their own community.

Instructional Strategies

- ELL Encourage English language learners use sticky notes to identify words or phrases that they are not able to understand. They can consult a dictionary or ask a classmate or you for help.
- Students can respond to the questions individually or discuss them as a class. Possible changes around the school might involve promoting better composting and recycling, reducing the electricity and water used at the school, and planting trees or a garden.
- Enrichment—Have students refer to their maps of nearby ecosystems from Activity 1.4 to find a local stream or other local ecosystems that they could adopt. Have students discuss ways they could help their chosen ecosystem both immediately, such as cleaning and adding bird boxes, and in the long term, such as planting trees and reintroducing species.
- Enrichment—Have students design a project similar to Yvonne's recycling plan or the Chaminade students' ecosystem recovery that they can present to the school's environmental club and follow through on.

Activity 1.18 Town Council Activity (Student textbook page 73)

Pedagogical Purpose

Students identify a local project that would have an effect on the environment, explore some of the different perspectives involved by role-playing concerned citizens, and work together toward a decision on the issue.

Planning	
Materials	Library or Internet materials **BLM G-15 Worksheet for Investigating Issues** (optional) **BLM G-16 Decision-Making Organizer** (optional)
Time	60 min in class 10 min preparation (recent newspapers articles might be required)

Background Knowledge

Approval and permits are required before almost any construction. Major building projects must be presented to town council before proceeding. Concerned citizens have the opportunity to attend meetings and address council.

Skills Focus

- identify and locate relevant resources
- communicate conclusions

Activity Notes and Troubleshooting

- Students are refining their research and communication skills and learning that all members of groups do not necessarily need to agree but must reach compromise. Encourage students to consider how the project they identify might affect people living nearby, people who would get jobs, people who might lose their jobs, people concerned about local ecosystems, investors, and others.
- Discuss with the class about the various viewpoints that could be taken by citizens regarding the local project. Use **BLM G-15 Worksheet for Investigating Issues**, or a similar format, to focus the discussion.
- Divide the class into groups of four or five, with each group representing a viewpoint. Groups can have one member who speaks for them at the town council meeting, but all group members should be involved in deciding what points the speaker should make.
- Students will gather a variety of data from different sources to organize and analyze. Make sure students analyze information gathered for reliability and bias. Remind students to address the issue of sustainability in their presentations.
- Have students make decisions about their citizen's point of view and the roles each group member will play in gathering data before they proceed. Remind students that everyone in the group must have a meaningful role. All organizational work must be completed in class before research begins.
- Students must present findings in an open forum. The presentation should focus on the outcome of the local project; that is, should it be approved, abandoned, or modified?
- Have other students take notes on the points made by each presenter so they can help make a decision or better understand the town council's final decision.

Additional Support

- Depending on current community activities, students can invent a project to focus on or select an actual activity that will affect their community. Refer to Investigation 1C from Topic 1.5, page 59, for local activities that affect the environment.
- DI Make sure that each group includes interpersonal thinkers to support others as they examine the chosen issue from their citizen's perspective, and to help with group dynamics as roles are negotiated. If possible, each group should also contain at least one visual-spatial learner and linguistic learner.
- ELL The activity does not require English language learners to speak on behalf of their group, but they should be active participants in the planning.
- DI Accept all forms of presentation. Students may wish to present their point of view with visuals, through performance, or in a song.

Activity 1.18 Answers

1. Answers may vary. Students should link learning about sustainability to their presentation.
2. Answers may vary. Students should recognize merits in arguments from other points of view.
3. Answers may vary. Students should recognize that through discussion, differing points of view can be appreciated, and a compromise can often be reached.

Using the Case Study Investigation

Literacy Support

Before reading

- Have students look at the imaginary article on the first page of the Investigation. Ask what they can determine about the content based on the date and the headline. Ask if they notice the humour of the newspaper's name and how the newspaper is read in the future.
- Ask students what else they can determine about the Investigation based on the headings, the photo of Toronto featuring construction, and the garden of native plants.

During reading

- While reading the Toronto Nova article, have students use the dates and ages to create a timeline for the story. Ask how old the main character would probably be now.
- Use the Pause and Reflect questions to check on student comprehension as they read through the Case Study Investigation.

After reading

- Have students complete the Inquire Further section.

Activity Notes

- Have students read the Case Study Investigation as a class. Stop at each Pause and Reflect question to have students respond to the question individually before discussing their responses with the class.
- DI Use the article in the introduction to invite volunteers to role play a conversation between the granddaughter and grandfather about how songbird populations have changed in urban areas.
- ELL Use the Case Study to acquaint English language learners and others with the names, appearances, and songs of some common local songbirds.
- DI Spatial learners should be challenged to design the garden in question 5 in three dimensions so that plants are getting adequate sunlight and there is available water.

- For useful websites about Project CHIRP!, go to **www.scienceontario.ca**.
- Enrichment—Have students design and execute a project around the school that would help local songbirds.

Answers

1. Urban sprawl can disrupt the natural habitat and food resources of songbirds.
2. Private citizens can provide food and shelter for the songbirds and by planting native species on their property, including fruit-bearing plants that might provide year round food for songbirds.
3. Project CHIRP! encourages more native plants in urban areas for songbirds shelter and food.
4. Answers may vary depending on location.
5. Answers may vary. Garden should feature all native plants and be sustainable.
6. Answers may vary depending on location.

Investigation 1D Local Environment Project

Pedagogical Purpose

In this activity, students identify sources of information that will allow them to learn about local projects that promote the sustainability of local ecosystems. Students then design websites, posters, or brochures to inform the general public of their findings.

Planning	
Materials	Internet or local environmental clubs brochures computer for preparing final displays **BLM 1-27 Investigation 1D** **BLM G-14 Research Worksheet** (optional)
Time	60 min in class 10 min preparation (identify local resources for students to contact or to invite to class)

Skills Focus

- communicate using a variety of formats

Activity Notes and Troubleshooting

- Discuss local environmental initiatives with the class. Use the examples in the introduction to the Investigation and any other projects you know of. Ask students to describe others that they know of. Do not forget to consider projects undertaken by the school's environmental club.
- Distribute **BLM 1-27 Investigation 1D** to students.
- Possible initiatives might include greening the grounds of your school, community projects to reduce the amount of pollution in a watershed, and the implementation of an Environmental Farm Plan (EFP) and farming practices within your local area.
- Provide brochures about local environmental issues or examples from past classes for students to examine.
- Allow students to form groups and choose a topic or create a shortlist of approved research projects and have students sign up for the project they wish to investigate.

- Monitor progress carefully here. Ensure that groups include a mix of learners who will be effective together. Have students submit research questions for approval before continuing.
- If you wish, distribute **BLM G-14 Research Worksheet** to help students plan their research.

Additional Support

- Many community organizations provide lists of speakers who will visit classrooms. Take advantage of these. As an alternative, have someone you know come in to discuss a local environmental project. Work with students to help them prepare questions for the speaker in advance. There may be someone from a green initiative such as Leadership in Energy and Environmental Design (LEED) or the Environmental Farm Plan (EFP) who could speak to the students. For useful websites, go to **www.scienceontario.ca**.
- DI Make sure that each group includes at least one visual learner and at least one linguistic learner.
- ELL English language learners are not required to present the final product orally, but they should be active participants in the planning.
- DI Suggest a variety of presentation formats including website, poster, brochure, song, television commercial (video or acted out), radio commercial, and discussion. Have each group present using a format that suits their interests and learning styles.
- Students can design a website on paper if computer access is unavailable.

Answers

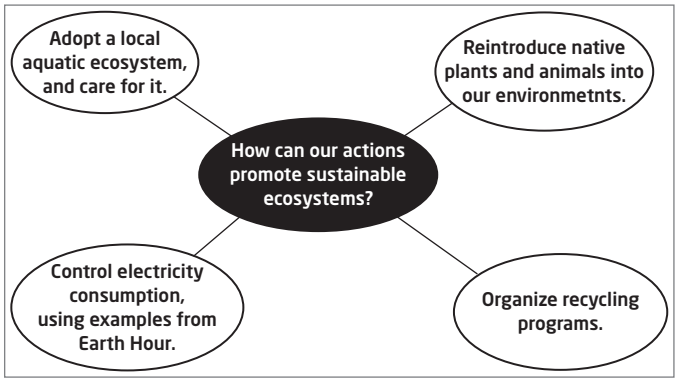
1. Answers may vary. Students should include evidence of critical thinking about their topic.
2. Answers may vary. Students should include viable, useful suggestions, and explain why each one would be effective.

Topic 1.6 Review (Student textbook page 77)

Please see also **BLM 28 Topic 1.6 Review (Alternative Format)**.

Answers

1. Answers may vary. For example:



2. Answers may vary. Students may add the concepts biodiversity and equilibrium as well as the refined definition of sustainability to their word maps.

3. a) Answers may vary. For example, creating nature reserves, putting up nest boxes, replacing urban sprawl with smart growth.

b) Answers may vary. PMI chart should reflect critical and creative thinking and be well organized. Recommendation should be a practical course of action based on the interpretation of the PMI chart.

4. Answers may vary. For example, students may state that nest boxes are simple solutions to create more space for birds every year. They also help make up for deforestation, and so would be a worthwhile activity. Students should include evidence for their statements.

5. An ecosystem in equilibrium is a state of balance between its diverse living parts and non-living parts.

6. Organisms that prey on the fish would lose their food supply, lowering their numbers or displacing them altogether. The organisms that would typically be preyed upon by the fish would have a large increase in their population. If the prey were plant-eating insects, this could lead to over consumption of plants damaging the ecosystem.

7. a) Urban sprawl is the increase in size of a city by spreading into natural areas and farmland rather than concentrating on growth in the centre of a city.

b) Answers may vary. A cause and effect map should reflect critical and creative thinking and be well organized.

8. Answers may vary. Students should demonstrate critical thinking when analyzing the online campaign.

Using Science at Work (Student textbook pages 78–79)

Literacy Support

Before Reading

- Have students scan the Unit to locate careers related to ecology that are mentioned or could be associated with material in the textbook. For example, ecologists are mentioned on page 11, and an architect would be involved with smart growth, mentioned on page 69.
- Ask students if they know anyone who has had a career related to ecology in some way.

During Reading

- After reading the description of fisheries technicians, have students anticipate possible answers to the interview questions before reading the responses.
- The interview could be read aloud by two volunteers, each taking one role.

After Reading

- Ask what students have learned about in this Unit that might be useful in Chandler Eves's work as a fisheries technician.
- Based on what students know, ask them what other careers could be added to the concept map on page 79.
- Have students complete the Over To You questions. The first two questions can be discussed as a class, but question 3 should be completed individually. Allow students to present the results of their research in a format of their choice. They should include information about skills and education required in the career.

Instructional Strategies

- If there is a local individual or organization such as a parent or friend who is involved in ecology, this might be the ideal time to invite them to talk to the class about their work.
- ELL Ask students to suggest one or two things a person in each career represented on page 79 might do.
- Most of the careers presented involve lots of work outdoors which may appeal to some students but discourage others. Have students also think about indoor parts of jobs, such as lab work, research, and organizing data, or ecological careers, such as a smart-growth architect, an engineer working on energy efficiency, or an educator.
- Enrichment—Three of the careers in ecology are explained in more detail and feature a photograph. Have students explain or research what the other five careers might involve.

Answers

1. Answers will vary and might include his educational background, his childhood experiences, what made him decide to choose this type of work, etc.
2. A fisheries technician must be a good problem solver because most of their work is in the field and done alone and the multiple problems that might arise must be dealt with immediately. There is no technical assistance available when working in the field.
3. Answers will vary. Students should research the level of education and skills required for their career.