

Impact of Urban Development

SNC1D Sustainable Ecosystems

Lesson Plan

Assessment FOR learning

Cross-curricular Geography

Big Ideas

- People have the responsibility to regulate their impact on sustainability of ecosystems in order to preserve them for future generations

Overall Expectations

- **B1.** assess the impact of human activities on the sustainability of terrestrial and/or aquatic ecosystems, and evaluate the effectiveness of courses of action intended to remedy or mitigate negative impacts;
- **B2.** investigate factors related to human activity that affect terrestrial and aquatic ecosystems, and explain how they affect the sustainability of these ecosystems;
- **B3.** Demonstrate an understanding of the dynamic nature of ecosystems, particularly in terms of ecological balance and the impact of human activity on the sustainability of terrestrial and aquatic ecosystems.

Specific Expectations

- **B2.1** use appropriate terminology related to sustainable ecosystems;
- **B3.1** compare and contrast biotic and abiotic characteristics of sustainable and unsustainable terrestrial and aquatic ecosystems;
- **B3.3** describe the limiting factors of ecosystems (e.g., nutrients, space, water, energy, predators), and explain how these factors affect the carrying capacity of an ecosystem;
- **B3.5** identify various factors related to human activity that have an impact on ecosystems, and explain how these factors affect the equilibrium and survival of ecosystems.

Learning Goals

- To understand how competing interests can affect a landscape
- To appreciate the complexity of urban planning when considering sustainability.

Description

In this activity, students create a landscape map and apply different development scenarios to see how the landscape of the ecosystem is affected.

Materials

- Handouts included with this lesson: Grid, tally sheet, biodiversity counter, ecosystem cards, development rules.
- Coloured pencils (to draw the ecosystem)
- Markers with three different colours (to delineate boundaries)
- A sheet of transparency film

Safety Notes

- N/A

Introduction

Urban Development

Start with a **brief discussion about urban development**. You can tie it in with other lessons you might do on studying impact of humans on ecosystems etc. Here are some questions to consider:

- Have you seen construction begin on new homes in your community? What used to be in the place where the homes are being built.
- What do you think the impact on the environment is?
 - Plants and animals lose space; some may be pushed out, more disturbances for the environment, possible pollution, less food for predators, etc.
 - A decrease in predator populations can lead to an increased population for other animals.
- Is it reasonable to halt development on new homes or commercial areas? (Why not? – economic development, jobs, places for people to live)
- These are questions that governments – especially municipal ones – must also answer.

Modeling Activity

- Today we want to create **our own models to simulate how development would affect the landscape of an ecosystem**.
- This is something urban planners also have to do – to predict the impact development would have on certain species for example, or on water flow, etc.
- You can try several different scenarios and even come up with your own and see how it would affect the model ecosystem

Action

Preparation and Ecosystem Map

- **Print out the sheets** for each group (grid, tally sheet and biodiversity counter in Excel file, development rules and ecosystem cards in PowerPoint file). If you wish, you can limit the number of animal sheets to speed up the activity)
- Hand out **colouring materials**.
- Form **groups of 2 or 3 students** (the activity could also be done by students on their own. The ecosystem elements card sheets can be shared to reduce the quantity of printouts being used)
- Get students to **design their own landscape by colouring in ALL the squares** on their grid using the following colours:
 - Green for forests
 - Yellow for fields
 - Blue for water
 - Brown for wetlands.
- Forests, fields, water, and wetlands must all be present, but students can choose the quantity that they use for each. This will affect their ecosystem model and makes each ecosystem unique. **Encourage creativity but also remind them that their ecosystem should be unique.**

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Initial Scenario

- We will now see what your ecosystem can support. You have been given a number of biotic and abiotic elements for your ecosystem. Each one has a card that tells you what this element needs in order to be present.
 - First, **count the number of squares for each element of landscape (forest, fields, wetlands, water) and use that information to complete the first column of your tally sheet.** Note that you won't have any protected or developed fields yet, therefore these fields already have a 0 in them. This is your land before humans make an impact.
 - Using the landscape grid and the available ecosystem cards, determine the quantity of each species of flora and fauna. You can use the biodiversity counter sheet on the excel file to help you keep track. Add the number of unique species to the tally sheet in the biodiversity box.
 - NOTE: Some of the conditions on the biodiversity cards will require discussion and it is possible that there is no right or wrong answer.

Development Rules (several scenarios if possible)

The government has set some rules for development (see handout) and we want to see how they affect our ecosystem. Students can now select areas they want to protect and open for development in their ecosystem. It's easiest if this is completed on transparency film to be able to distinguish between the different scenarios. If you do not have transparency film to use, the activity can still be completed using different coloured pencils to draw the outlines of the new areas.

- **Overlay transparency film** on your map and then:
 - Outline the protected areas first as this land is set aside before development begins.
 - **Outline the industrial areas and residential areas next.**
- Once all your areas are outlined, **record the results** on the tally sheet. Use the tally sheet to **calculate the income and population.**
- Finally **determine which flora or fauna are still present in your ecosystem.** Use the biodiversity counter sheet to help you keep track and **record the total number for "biodiversity" on the tally sheet.**

Repeat exercise with different development rules or come up with your own rules and see what happens!

Consolidation/Extension

Discuss the results. Points to consider:

- How was **biodiversity** affected by different rules?
 - How was the **income and population** affected by different rules?
 - Were **particular animals affected** more than others by development?
 - Discuss **sustainability**:
 - Sustainability means that we can sustain a certain state of the ecosystem for the long term. It means that a certain amount of biodiversity can co-exist with economic activity and humans living in the area.
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- How do different rules (laws) affect the sustainability of the ecosystem?
 - Does protecting more land help species survive?

 - Discuss the impact of different scenarios on **farmers, hunters, and campers**. Also discuss how students perceive the impact of each scenario on **water and soil** (Note: A card for soil and water are included in the handout to make students think about how they are affected as they do their scenarios).

Possible extension:

- One way to reduce the economic impact of limiting development is to **build a tourism industry**. Tourists love to visit beautiful protected land. To see the impact tourism could have on the economy, try taking one of your scenarios and **make each protected square worth something**, for example \$5000 (less than the \$10,000 it would get for industrial development but still a significant number). Evaluate how this income from tourism affects the total income. Does tourism make it easier to justify protecting land?
 - **Look at local regulations**. How is development regulated in your community? Do these regulations allow for sustainability of the ecosystem? Etc.
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