Green Foundation Ireland

Education Module for Transition Year Students

Biodiversity

Lesson Plan

January 2026

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INTRODUCTION

Value of educating transition year students on biodiversity

This is the Lesson Plan document for Green Foundation Ireland's Transition Year Module on Biodiversity, to be used in conjunction with the Teacher's Resource document and Work Sheets. This document contains suggested lesson plans, discussions and exercises to assist students in engaging with the material.

Biodiversity is an engaging and increasingly urgent priority throughout the world. Biodiversity has a huge amount to offer humanity in terms of provision of natural resources, mental and physical well-being, as well as cultural, moral and aesthetic fulfilment. Due to many anthropogenic factors, biodiversity has seen a significant decline in recent times, with an estimated just under 70% loss of wildlife in the last 50 years and, as such, it is essential that young people be educated and equipped with the tools to prioritise sustainability into the future.

The Lesson Plan encourages students to discuss and research several open-ended questions, using the knowledge provided in the Teacher's Resource as a basis for the teacher to work from. Teachers may need to conduct their own research to fully engage with class materials.

Throughout this module, a focus is placed on understanding different viewpoints and perspectives, as successful conservation involves large-scale involvement and engagement. Other important topics are also reinforced, such as climate conscience, sustainability, and ecocentric values.

Learning outcomes

Through completion of this module, students will develop their knowledge on the following topics:

1. Understand terms relating to biodiversity, ecology and ecosystems.
2. Appreciate the value of biodiversity and ecosystem services provided to humanity.
3. Learn how diversity is surveyed and measured.
4. Identify threats and pressures facing biodiversity.
5. Understand the legal policies put in place to protect biodiversity.
6. Learn about conservation practices in Ireland and the world.
7. Carry out a hypothetical Environmental Impact Assessment.
8. Learn about the range of careers in biodiversity and conservation.
9. Develop project planning skills via group projects.
10. Develop research and presentation skills via class presentations.

Transition Year (TY) is a period wherein students further develop a range of skills, including critical thinking, observational, opinion forming, research, communication, and others. As such, the delivery of this module is designed to encourage these skills through a mixture of class discussion, practical experiments, and research project delivery.

Module structure

The following module lesson plans are intended as a resource for teachers for delivery to transition year students on a weekly basis. Class discussions and short research projects throughout the module are often performed in one class. Typically, students are invited to explore the concepts of a lesson at the beginning, prompting engagement and active participation in the learning. If time does not allow, teachers can choose to assign homework and review this at the beginning of the next lesson. Lessons 1, 3 and 4 are primarily demonstration and discussion-based, while lessons 2, 5 and 6 are focussed on class exercises and projects.

To allow for flexibility within delivery, six lesson plan outlines are provided, each featuring core topics and exercises, as well as extra topics and exercises, should material need to be extended or contracted to fit class time. Core versus extra information is clearly labelled within each lesson plan, with extra information being *italicised and underlined*, meaning this information can be omitted or included depending on time available.

LESSON 1: Introduction to biodiversity and concepts

Class question: What does biodiversity mean to you?

- Genetic diversity.
- Species diversity.
- Ecosystem diversity.

Class question: What aspects of biodiversity, conservation and sustainability are most interesting to you?

Class question: What do you hope to learn in the coming weeks?

Class demonstration: Biodiversity terms (with examples)

- Ecosystem.
- Ecosystem engineer.
- Habitat heterogeneity.
- Generalist vs specialist species.
- Redundancy.
- R-selection and K-selection.
- One potential way to encourage engagement within this lesson, would be to provide each student or group of students with one of the bolded definitions in the Teacher's Resource and ask them to research and present information and illustrative examples of it, with support and feedback from the explanations below as well as any research done by the educator.

Class question: *What type of environment and abiotic factors are local to your school and how does that impact the species that live there?*

Class question: *What are generalist vs specialist species? Can the class think of any examples of generalist and specialist species?*

Class research project: As a class project, divide the class into groups and ask them to research and present information on one of the 36 biodiversity hotspots on earth. Alternatively, you may wish to research and present data to the class on one or two individual hotspots.

- What factors make this area a hotspot?
- What unique species live here?
- What threats face this hotspot?
- What protections are in place to protect it?

Class demonstration: *symbiotic relationships*

- *Mutualism*.
- *Commensalism*.
- *Predation/herbivory*.
- *Parasitism*.
- *Competition*.

Lesson 1 within the Teacher's Resource contains many detailed definitions so, depending on time availability, an educator may wish to discuss only some of them and retain others for discussion in the following week(s).

LESSON 2: Measuring biodiversity

Class question: How is biodiversity measured?

Class question: What is the value of measuring biodiversity?

- *In what circumstances would biodiversity need to be measured? Regular monitoring, Environmental Impact Assessment, etc.*

Class exercise: Lead a class trip to a local unmanaged field, beach or other natural area and calculate alpha, beta and gamma diversity of the area using the Teacher's Resource methodology and a transect, which can be easily constructed (and may be familiar to you from Junior Certificate experiments!). Species richness and evenness can also be calculated.

Class exercise: *Prepare some hypothetical questions concerning the number of animals captured and recaptured as part of a capture-release experiment and ask students to calculate actual population sizes.*

Class question: *What is an indicator species? Can you think of any examples?*

Class exercise: If a class has access to a safe nearby river system, attempting to survey, using kick sampling and an insect identification system would be an engaging way of surveying local water systems and developing understanding of how indicator species are insightful to ecological studies. Alternatively, assessing the structure of local lichens on stones or trees can be used to assess local air quality.

LESSON 3: Value of biodiversity

Class question: What is the value of biodiversity? How do humans benefit from it?

Class demonstration: Anthropocentric vs ecocentric views.

- *How does this class feel about these viewpoints? Does anyone feel strongly in one direction or the other?*

Class exercise: *If appropriate, you may wish to organise the class into two teams to debate the merits of anthropocentric vs ecocentric viewpoints after taking some time to confer and develop arguments.*

Class question: What are ecosystem services? Can you think of any examples?

- Provisioning.
- Regulating.
- Cultural.
- Supportive.

Class exercise: Within this lesson, divide the class into groups and select a different natural area (beach, forest, grassland, bog) and have each group research and present information on the ecosystem services provided to humanity by that area.

Class question: What is carbon sequestration?

- *How can gardens be geared towards carbon sequestration?*

Class question: What negative impacts on humanity does biodiversity loss have?

- Zoonotic diseases.
- Food security issues.
- Genetic resources loss.
- Ecosystem services loss.
- Mental and physical health effects.

LESSON 4: Threats to biodiversity

Class demonstration: Threats to biodiversity:

- Climate change.
- Deforestation/land use change.
- Habitat fragmentation.
- Invasive species.

Class question: *In order to comprehensively combat biodiversity loss, it is essential to understand why it happens. What incentivises humans and corporations to cause each the threats discussed?*

Class question: *What can be done to effectively reduce the impact of each of the discussed threats?*

Class question: What is an invasive alien species? How might they be introduced?

- What are some examples of invasive alien species in Ireland?
- What factors might make a species invasive?

Class question: What threats specifically face ocean ecosystems?

- Overfishing.
- Acidification.

Class question: What is greenwashing?

- *Can the class think of any examples of greenwashing? Either in case studies or hypothetical scenarios? How can we think critically in future about the environmental concepts used in the marketing strategies for companies?*

LESSON 5: Conservation methods and policy

Class question: How money can be used to encourage biodiversity?

- Purchasing of land from landowners for rewilding, creating reserves, etc.
- Funding research and monitoring programmes to track trends in wildlife populations.
- Creating aids for wildlife, such as wildlife corridors, barriers to roadways, etc.
- Ecosystem services payments to landowners who protect forests or natural habitats.
- Education programmes and campaigns to raise awareness.
- Conservation projects such as species reintroductions or captive breeding programmes.
- Enforcement of laws to prevent illegal hunting, logging, or resource extraction.

Class exercise: The idea of reintroducing wolves to secluded natural locations around Ireland has been suggested in recent years. Discuss the possible reintroduction of wolves to the Wicklow mountains. Have different groups of the class represent different interest groups reflecting the public (farmers, conservationists, local residents, tourism businesses, etc) and create their own arguments for or against the idea. Some key points likely to arise:

- Wolves have been successfully reintroduced in various parts of the world, and attacks on humans are extremely rare and unlikely.
- Wolves control deer populations, thus leading to less overgrazing, allowing plant life to flourish, as well as reducing road collisions and tick populations. In previous reintroductions, biodiversity has increased as the natural predator has been reintroduced and this impacts the food web.
- Farmers frequently worry for their livestock and, in cases where wolves do attack livestock, compensation must be administered.
- Wolves will attract tourism to the area, with the positives and negatives that brings.
- Local residents may justifiably fear wolf attacks, even If the likelihood is extremely low.

Class demonstration: *Present information to the class on a local or regional Special Area of Protection, examining why the area is protected and what measures are in place to protect that area.*

Class exercise: In groups, ask the class to perform an Environmental Impact Assessment for a hypothetical local or regional project. Propose a hypothetical construction project (for example, constructing a wind turbine on a hillside, constructing a new hotel and golf space in a seaside area, or a mining operation in a wooded area). Using real-world local natural sites should help students to visualise potential impacts.

- How might this project impact the environment and local species in the short term? The long term?
- What mitigation measures could be put in place to reduce potential negative impacts?
- *How might this project impact human culture and well-being?*
- *How could the original proposal be altered to reduce environmental impact at this site?*

LESSON 6: Biodiversity careers and future

Class question: What biodiversity or conservation careers is the class aware of?

Class question: What careers in this field would you be interested in pursuing? What skills would be needed for that job?

Class exercise: Divide the class into groups and ask each group to develop a hypothetical project plan to address a local or national biodiversity issue, awareness campaign, or conservation project. The project plan should include details about:

- Project summary and goal: What is the goal of the project? What meaningful difference would this project make?
- Engagement: Who would be needed or expected to engage with such a project? Members of the public, policy makers, professional biologists/ecologists, farmers, landowners, etc? In human terms, who would benefit most from this project and why? Who would potentially be against this project?
- Budget, costs, timeframe: What would this project require? Land, resources, training, seedlings? What would the expected costs be, and where would funding come from?
- How would the success of this project be measured? Surveying the public? Measuring change in biodiversity in an area?
- Challenges: If appropriate, groups should be encouraged to give constructive feedback on each other's projects. Would there be resistance to the project from any stakeholders or businesses? Potential issues should be flagged and solutions to those issues developed collaboratively.
- Finally, after each project has been detailed, encourage the students to discuss how the different projects may impact each other. In the real world, these projects do not exist in isolation and may bolster the success of other projects.

Finally, time allowing, the teacher may wish to use the latter portion of this lesson to reflect on and discuss with the class particular topics they have enjoyed learning about and may wish to pursue in future.

About Green Foundation Ireland

Green Foundation Ireland aims, through education, to inspire the public to work towards a sustainable society for Ireland.

Green Foundation Ireland (GFI) is an independent registered charity which promotes education for sustainability in Ireland. It is affiliated to the Green European Foundation (GEF).

GFI aims, through education, to create public support for a sustainable society and economy in Ireland and elsewhere. We aim to engage with both the arts and sciences to create a new environmental narrative that promotes action to conserve and protect life on earth.

For more information about what Green Foundation Ireland does, or if you would like to contribute to our work in any way, please contact us at:

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