Sustainable Ecosystems and Climate Change: Unit Overview

SNC1W, Grade 9 Science (De-streamed), Unit 2. 15 classes of 75 minutes, plus work periods for the summative and one class for the unit test (about four weeks).

The big question

How do ecosystems stay in balance, and how are human activities and a changing climate affecting that balance?

Students explore Earth's four spheres, build eco-columns, trace energy flow with the 10% rule and follow carbon, water and nitrogen through their cycles. Hands-on labs use cheap materials: floating spinach leaf disks for photosynthesis, yeast and balloons for respiration, schoolyard quadrats for biodiversity and simple soil, air and water tests. Students analyse human impacts, code with an original lake-ice data set to read the climate signal, examine climate impacts on ecosystems and on communities across Canada (including First Nations, Métis and Inuit communities), learn from sustainable practices such as the Three Sisters and cultural burning, explore agricultural innovations and evaluate climate solutions. The unit ends with a Local Ecosystem Health Report and a unit test. All data sets and scenarios are original.

Lessons

#	Lesson	Classes	Question	Expectations	What's inside
1	**What Is an Ecosystem?**	1	How do Earth's spheres interact?	B2.1, A1.1	Biotic and abiotic; four spheres; sphere map
2	**Build an Eco-Column**	1	Can we model an ecosystem?	B2.1, A1.3, A1.2	Two-chamber bottle ecosystem; fair test; observation log
3	**Energy Flow**	1	Where does energy go?	B2.2	Food chains and webs; 10% rule; energy pyramid
4	**Cycling Matter**	1	How is matter reused?	B2.2, B2.1	Carbon, water and nitrogen cycles; carbon journey
5	**Photosynthesis Lab**	1	Can we see photosynthesis?	B2.3, A1.2, A1.5	Floating leaf disks; graph; equation
6	**Respiration Lab**	1	How do cells release energy?	B2.3, A1.5, A1.2	Yeast and balloons; comparing the two processes
7	**Biodiversity and Succession**	1	Why does variety matter?	B2.4, A1.2	Schoolyard quadrats; species richness; succession
8	**Soil, Air and Water Quality**	1	How healthy is it?	B2.4, A1.2, A1.5	Four testing stations with cheap materials

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#	Lesson	Classes	Question	Expectations	What's inside
9	**Human Impacts**	1	How do we push ecosystems out of balance?	B2.5, A2.4	Impact chains; zebra mussels; community ranking
10	**Reading the Climate Signal**	1	What do the indicators show?	B2.6, A1.4	Greenhouse effect; indicators; Python with lake-ice data
11	**Climate Change and Ecosystems**	1	What's changing, and what's being done?	B1.1, B2.6	Impact gallery; mitigation and adaptation; initiatives
12	**Climate Change and Communities**	1	Who is affected, and why?	B1.2, A2.3	Six community cases; SmartICE; why impacts differ
13	**Learning from the Land**	1	What can sustainable practices teach us?	B1.3, A2.5	Three Sisters; cultural burning; Two-Eyed Seeing
14	**Farming the Future**	1	Can farming work with the cycles?	B2.7, A2.1	Six innovations; energy and food; design an experiment
15	**Taking Action**	1	Which solutions really help?	B1.1, A2.4	Claim check; action ranking; summative launch

Assessment

Type	In this unit
Assessment for learning	Wetland walk, sphere map, design plan and observation log, food web and energy pyramid, carbon journey, lab sheets, quadrat survey, station data, impact chains, code the ice, impact gallery, community cases, practices and science, innovation match, claim check, exit tickets
Assessment as learning	Self-checks against success criteria, peer feedback on plans
Assessment of learning	Local Ecosystem Health Report with rubric (suggested weight 7% of the final mark) and Unit Test with answer key (suggested weight 5%)

What's included

In the Start Here folder:

- **Summative Task and Rubric:** the Local Ecosystem Health Report, with a safety section and a checklist
- **Unit Test and Answer Key:** multiple choice, short answer, a 10% rule calculation and an application question, with model answers and marking guides

Safety: every hands-on activity has safety notes in its lesson plan, including outdoor work, lamps and water, warm water and balloons (check for latex allergies), and soil and water samples. Content about First Nations, Métis and Inuit

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communities uses specific, documented examples; where possible, invite a local knowledge keeper through your board's Indigenous education office. Coding uses free Python.

What's in each lesson

- Teacher lesson plan with expectations, timed sequence, differentiation, look-fors and answer guides
- Slides with speaker notes
- Student handouts and organizers
- Editable Word and PowerPoint files, plus PDFs

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