Ecological Succession Lab: NYSSLS Alignment

Teacher guide for the student worksheet at mrsajdak.com/succession (two pages, 16 questions). Environmental Science, Chapter 5, Lesson 5.2: How Do Ecosystems Respond to Changing Conditions? Plan-book objective ES.2.5.5: describe primary and secondary ecological succession and predict community change. © 2026 Ryan Sajdak. Free to use, share and change under CC BY-NC-SA 4.0 (creativecommons.org/licenses/by-nc-sa/4.0): give credit, do not sell it, share your version the same way.

Objectives

The same two statements are printed at the top of the worksheet, each with a box to tick. They match plan-book objective ES.2.5.5 and are worded the same as on the lesson worksheet. The lesson has a third statement, "I can describe how pioneer species start primary succession and build soil"; Q3 and Q14 assess it.

I can	Questions
compare primary and secondary succession using numbers for time and soil.	1 to 5, 12, 13
use inertia and resilience to predict how a community changes after a disturbance.	6 to 11, 15, 16

Performance expectations: building toward

The lab and worksheet give students evidence for these performance expectations. They are one step on the way, not a full assessment of any one of them.

> **HS-LS2-1**
> *"Use mathematical and/or computational representations to support explanations of biotic and abiotic factors that affect carrying capacity of ecosystems at different scales."* Worksheet link: soil depth (an abiotic factor built by living things) sets how many species and how tall a community a place can hold; students compare the two places with numbers and ratios at time scales from 1 to 600 years (Part 1).

> **HS-LS2-2**
> *"Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales."* Worksheet link: species counts rise and fall through succession (Q2, Q5); real Mount St. Helens cover and species data compared across three sites (Q12).

> **HS-LS2-6**
> *"Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem."* Worksheet link: inertia and resilience measured on three communities (Q6 to Q11); a cleared rain forest and an invaded forest become different communities (Q9, Q11); students evaluate two classmates' claims (Q10, Q16).

DCI LS2.C: *"A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability."*

Part by part

Part	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	What students do
1. Fast-forward a place Q1 to 5	SEP 5 Using mathematics and computational thinking SEP 2 Developing and using models	LS2.C ecosystem dynamics	Scale, Proportion, and Quantity; Stability and Change	Run bare rock (primary succession) and an empty Buffalo lot (secondary succession) through time, record the year each of five stages begins, measure soil, species, height and cover, and compute how many times

				as long the rock takes. Name the pioneers and how they build soil.
2. Disturb it Q6 to 11	SEP 2 Developing and using models (predict, run, compare) SEP 7 Engaging in argument from evidence	LS2.C resilience	Stability and Change; Cause and Effect	Predict, then run fire, flood, windstorm, clearing and an invasive plant on a grassland, a temperate forest and a rain forest at three sizes. Measure inertia (change) and resilience (years back to 90%) and argue that the two are different properties.
3. Mount St. Helens Q12 to 15	SEP 4 Analyzing and interpreting data SEP 7 Engaging in argument from evidence	LS2.C	Stability and Change; Patterns	Read real plant cover and species data, 1980 to 2009, at a blast-zone ridge, a mudflow slope and an ash-covered meadow; classify each as primary succession, secondary succession or mostly survived; identify the pioneer (Pacific lupine); predict 2040.
Wrap it up Q16	SEP 7 Engaging in argument from evidence	LS2.C	Stability and Change	Argue against "a destroyed forest always grows back the same way, at the same speed" with one model number and one real number.

Also in play

- **Explore, then explain, then apply:** each part starts with data questions (Q1 and 2, Q6 and 7, Q12). A READ FIRST line on the sheet then sends students to the green **Learn It** box in the lab, which opens once they have the data, before the questions that use the ideas (Q3 to 5, Q8 to 11, Q13 to 15). The slideshow has a matching Learn It slide at each of those points for whole-class teaching. Pioneer soil-building, shade, inertia, resilience, invasives and nitrogen fixation are all taught there before they are asked.
- **Misconceptions:** "an ecosystem that resists damage also recovers fast" (Q10: rain forest, 20% change in a fire but no recovery after clearing); "succession always ends in the same place at the same speed" (Q16); "primary means nothing was living there" (Q13 turns on soil, not on what was living).
- **Nature of models:** Tab 1 stage years and measurements are tuned to a typical Great Lakes pattern and rounded; Tab 2 numbers are made up to show the pattern the textbook describes. Tab 3 is measured. The Tab 2 grassland/rain forest contrast (low inertia, high resilience against high inertia, low resilience) is the textbook's own example.
- **Builds on:** the Chapter 5 introduction (primary against secondary from "is there soil?"). **Leads into:** Lesson 5.3, What Limits the Growth of Populations? (mrsajdak.com/populations).

Standards text quoted from the New York State P-12 Science Learning Standards, High School Life Science (NYSED). Sources: R. del Moral, Thirty years of permanent vegetation plots, Mount St. Helens, Washington, USA, Ecology 91:2185 (2010), Ecological Archives E091-152 (Tab 3 data: Studebaker Ridge plots 1 to 10, Pine Creek A plots 1 to 4, Butte Camp B plots 1 to 6); F. S. Chapin III and others, Mechanisms of primary succession following deglaciation at Glacier Bay, Alaska, Ecological Monographs 64 (1994), for how pioneers build soil and nitrogen. The answer key is a separate file, kept off the public site.