

The Boomtown Game

Students will learn how community decisions affect land use and ecosystem services as they play this board game. An ecosystem service is any positive benefit that wildlife or ecosystems provides to people. The benefits can be direct or indirect – small or large.

CREDITS: Activity developed by UCAR AirWaterGas Teachers-in-Residence Eileen Duncan and Sarah Johnson.¹ This version was made possible by collaboration between Inside Energy and AirWaterGas, a Sustainability Research Network funded by the National Science Foundation.

AirWaterGas



GRADE LEVEL: 6-12

LESSON FORMAT (CONTENT): Hands-on activity involving calculating, reading, and analysis of data, events, and outcomes

TIME REQUIRED: Preparation Time: 1-2 hours; Class Time: at least three 50-minute class periods or more if you wish students to play for longer.

LEARNING GOAL: Students will understand that ecosystems contain services that nourish and sustain life and the decisions that we make about land use impact the value of ecosystem services.

MULTIMEDIA RESOURCES

This activity can be paired with the Inside Energy video, "[Drilling: A High-Stakes Game](#)" to aid in comprehension and provide additional discussion points about the community decision-making process related to oil and gas development. The video can be used before the activity as an introduction, or after the activity to promote sense-making.

MATERIALS FOR EACH GROUP OF 2-6 STUDENTS

- One Grid for Community Map (print 11" x 17") ([PDF](#))
- One set of Part 1 Student Pages ([PDF](#))
- One set of Part 2 Student Pages ([PDF](#))
- One set of Part 3 Student Pages ([PDF](#))

¹ <https://www.airwatergas.org/resources/curriculum/boomtown-game/>

- Colored pencils or markers
- One 10-sided die
- Calculator
- Ruler

MATERIALS FOR THE CLASS

- One set of game cards ([PDF](#))
- One Boomtown Game Board ([PDF](#))
- One 10-sided die (in addition to the dice for groups)

STANDARDS

Next Generation Science Standards

- **MS ESS3-4** *Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.*
- **HS-ESS3.A** *All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors.*
- **HS-ESS3.C** *The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources.*
- **Science and Engineering Practices:** *Analyzing and Interpreting Data, Constructing Explanation and Designing Solutions Engaging in Argument from evidence*
- **Crosscutting Concepts:** *Cause and Effect, Systems and System Models, Stability and Change*

Colorado Academic Standards - Science

- **SC09-GR.HS-S.3-GLE.5** *There are costs, benefits, and consequences of exploration, development, and consumption of renewable and nonrenewable resources.*
- **SC09-GR.6-S.3-GLE.3** *Earth's natural resources provide the foundation for human society's physical needs. Many natural resources are nonrenewable on human timescales, while others can be renewed or recycled.*
- **SC09-GR.8-S.2-GLE1** *Human activities can deliberately or inadvertently alter ecosystems and their resiliency*

AP Environmental Science – The Living World

- **Ecosystem Diversity** *(Biodiversity; natural selection; evolution; ecosystem services)*

LESSON PREP

1. Print the game board (in color, if possible, and on 11 x 17" paper). Cut out the game board sides and attach them to make a square board, much like a Monopoly game. Cut out the game pieces – the circles with community numbers that are in the dame document as the game board. Consider laminating the game board and pieces if you are intending to use the game repeatedly.
2. Print the game cards double sided and cut them out along the lines separating cards.
3. Arrange your classroom to accommodate six groups. Each group should not have more than six students and no less than three students. You'll need an additional table for the game board that all students can access.

4. Copy one set of activity sheets for each group (six total).

INTRODUCTION

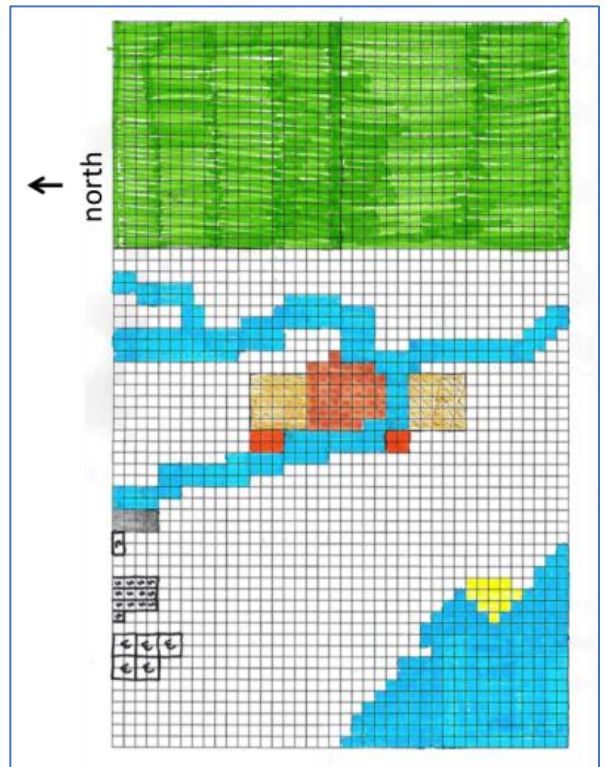
Boomtown Monopoly is a lesson in how human population and consumption of natural resources impact Earth's systems. Students from grades 6 through 12 can play as well as some introductory college courses. While created for science classes, this game could be played in social studies, economic, geography and history classes as well.

The goal of the game is to help students consider how humans use and develop land over time, how ecosystems around us are affected by land use decisions. There is a value to ecosystems that is obvious, such as a value of the timber in a forest, and then there is a value that is often hidden, such as how water is cleaned when traveling through the forest soils.

DIRECTIONS

Part 1: Build a Community

1. Have students brainstorm as a class the types of places that are in their community. (*Students may mention apartments or houses, stores, restaurants, factories, for example*). Have students group the places they brainstormed into three categories: residential areas, commercial areas, and industrial areas. Explain that some areas have mixed residential, commercial, and industrial areas and there can be open land that is unused surrounding a town. Some communities have a river that flows through it or lakes and reservoirs. Some towns/cities are in or near forest or grassland ecosystems.
2. Have students work in small groups (3-6 students) to create a map of a fictional community that they will use to play the game. Handout the "Building Your Community Instructions" handout, one "Grid for Community Map," colored pencils, and a ruler to each group.
3. Once students complete their initial community layout, handout "Providing Power to Your Town." Give each group a list of available energy types for their community. Ask them to complete the "Energy Selection Worksheet" in the hangout.
4. Handout the "Adding Energy to Your Town," and ask students to place energy power plants on their maps.
5. Collect the maps and keep them for part 2. Make sure that the names of the students in each group are on each map.



Above: Example of a student-made community map, with colors and symbols relating to the key in the "Building Your Community Instructions" handout

Part 2: Play the Game

1. Briefly discuss with students some ways humans can impact their environments. (Examples can include waste management, use of natural resources, pollution of air and water, changing land use). Tell students that as they play the Boomtown game, they will need to make choices that have impacts on the local environment, their city budget, or both. Students will be able to see how their community changes over time and what impacts occur.
2. Have students sit in the same groups as during Part 1. Handout the community maps, one set of the Part 2 Student Pages. Make sure that each group has a calculator.
3. Assign a number between 1 and 6 to each community. Have groups make a sign for their community number. (During the game there are times when communities interact, so they will need to be able to find each other.)
4. Review the student pages as a class. Ask students to choose roles (Banker, Population Manager, Energy Manager, Open Space Manager, Forest Manager, Water Manager). If groups are small, ask students to take more than one role. Note, both the banker and open space manager jobs are the busiest so should be only done by one person. Students should double up on the other four jobs if needed.
5. Have students play the game for at least 45 minutes. Play longer if time permits. Students will see greater changes and more impacts to their communities by playing the game for more time. If possible, allow 2-3 class periods for game play.
6. While playing the game students will be keeping track of the number of squares on the community map. This is for ease of keeping track of how much land is being used for what. Remind students that when asked for acreage that they need to add a 0 to their number of squares, since 1 square = 10 acres.
7. Have groups collect all their game materials in a folder at the end of each period of game play. The materials will be used in Part 3, too.

Part 3: Boomtown Game Analysis

1. Have students look at their community map and note that, generally, there are three ecosystems in the communities they created: Water (river and lake), a forest, and open space (grasslands). Ask students what kinds of things do they think these ecosystems provide to them and their community. (*Students may suggest clean water, food, beautiful places, places to run and walk, clean air*). Explain that these things we get from ecosystems are called “ecosystem services” and a monetary value can be associated with each to help communities with decision-making.
 - Ecosystem services can be provisioning – meaning they provide humans with certain things like food, wood, water.
 - Ecosystem services can be regulating – meaning they store carbon, purify water, clean the air, control flooding.
 - Ecosystem services can be supporting – meaning they help with soil formation, photosynthesis, support and provide biodiversity, habitats for animals.
 - And, ecosystem services can be cultural – meaning they supply aesthetics (beauty), allow for recreation, and education, etc.
2. Tell students that in this part of the activity, they will analyze how changes to land use during the game affected ecosystem services.
3. Have students sit in their groups and hand back their Community Maps and all worksheets used in the game and complete their Game Analysis Worksheets using information from their worksheets as well as their community maps.

4. Once the worksheet is filled out ask students to discuss and write down some of their observations about how their community changed over time. Then discuss the changes as a class.

ASSESSMENT

The observations of the game that students document during Part 3 (above) can be used to assess student learning. A class discussion can add to the assessment. The discussion may go in different directions based on the class needs. For example:

5. Middle school teachers may want to discuss how the ecosystems changed and compare and contrast the different communities, discuss how humans impacted the ecosystems, and what humans could do differently. They could also go into the water cycle and how it changed or was altered or they could go into the carbon cycle and how it changed.
6. A high school teacher may want the students to come up with solutions to some of the problems the student realized were happening within the community. They could use evidence from the game to support their ideas.
7. An AP Environmental Science teacher may want to delve into sustainability and have students come up with solutions to problems. The teacher could even dive deeper into other subjects like nutrient cycling, air and water quality issues, drought and famine, etc.

Background information:

Land use decisions impact ecosystems. Often, to guide decision-making, the monetary value of ecosystems is assessed, taking into account the value that ecosystems have to humans. Benefits that humans get from their environment are called ecosystem services. Some of these benefits guarantee our survival, while others provide have a more intrinsic value. The benefits can be direct or indirect – small or large. There are four types of ecosystem services:

- *Provisioning* – an object or resource that humans can take from the environment. Examples: food, fossil fuels, timber, medicine, drinking water.
- *Regulating*– a natural process within an ecosystem that benefits human existence. Examples: water purification, pollination, decomposition, carbon storage.
- *Cultural*– a non-material benefit that contributes to an areas culture and experience. Examples: recreation, art, relaxation, national parks, visual display,
- *Supporting*– a natural process that supports all other ecosystem services. Examples: water cycle, photosynthesis, soil formation, biomass production.

EXTENSIONS

1. Have students explore their local community to look for similar impacts.
2. Watch the news media for events similar to the ones that occurred in the game.
3. Have a debate about one or more of the issues that came up during game play.