



<b>Trip #5: Reservoir:</b>	<b>How I will travel:</b>
<i>Stamp above</i>	

<b>Trip #6: Reservoir</b>	<b>How I will travel:</b>
<i>Stamp above</i>	

<b>Trip #7: Reservoir:</b>	<b>How I will travel:</b>
<i>Stamp above</i>	

<b>Trip #8: Reservoir</b>	<b>How I will travel:</b>
<i>Stamp above</i>	

After the game has ended, use the space below to draw a diagram or write a short story about your journey through the nitrogen cycle.

# Of Microbes and Men: The Alpine Nitrogen Cycle Game

## *ScienceLIVE Lesson Plan*

Grades 6-12

### Summary

Students play the role of nitrogen atoms traveling through the nitrogen cycle in an alpine environment.

### Learning Goals

- Nitrogen makes up approximately 80% of the earth's atmosphere, and is a vital nutrient to all living things.
- Nitrogen undergoes cycling and transformations so that it can be usable to many different life forms.
- Nitrogen is stored in several different reservoirs such as the atmosphere, living organisms, soils, and surface water.
- Human actions are changing the nitrogen cycle by converting atmospheric nitrogen to more available forms in the cycle through fertilizer production and fossil fuel emissions.

### Materials

- 14 dice
- 14 station cards with dice codes
- 14 different small rubber stamps
- 14 ink pads
- One Key to Stamps
- For each student: Pen or pencil, Passport Handout

### Game Set-Up

Place the placards at stations around the room, with a stamp and ink pad at each station. Tell students that they will be playing the role of a nitrogen atom, and that each station is a nitrogen reservoir that students will be travelling through. Hand out the Nitrogen Passport, and explain that students will record their journey through the nitrogen cycle using their passport. Students can begin at the station of their choosing. To begin, students stamp in the "Trip #1" box, and write down the name of the station in the same box. Next, students roll the die to find out where they will travel to next. Make sure that students write down how they will travel before they leave their current station. When playing the game, students may not go to all of the stations, and they may visit some stations more than once. After everyone is finished with the game, ask students to use the space provided on their passport to draw a diagram or write a short story illustrating their journey through the nitrogen cycle.

### Discussion Questions

- How many stops *can* you make on your trip?
- Will your journey ever end?
- Was everyone's journey the same? Why not?
- Can someone give an example of *Nitrogen fixation* on their journey? *Nitrification*? *Assimilation*? *Mineralization*? *Weathering*? *Denitrification*? *Leaching*?
- What would happen if a farmer used too much fertilizer? (i.e. everyone starts from the fertilizer station at the same time)
- Livestock farming creates a large amount of animal waste. How would this affect the nitrogen cycle?
- What environmental and human factors control the nitrogen cycle? For example, what factors influence how much N is leached from fertilizer and livestock waste into the water system?

### Teaching Tips

- Encourage students to use new vocabulary to explain their journey through the nitrogen cycle. Write the vocabulary on the board or keep the nitrogen cycle diagram from the PowerPoint presentation displayed.
- Encourage students to play the game alone rather than with a partner or group.
- The activity can easily be cut short by asking students to get the last stamp at the station they are at, then return to their seats.
- For further assessment, have students create their own game based on the phosphorus, carbon, or water cycle.

### Sources

[http://www.windows2universe.org/teacher\\_resources/teach\\_nitrogen.html](http://www.windows2universe.org/teacher_resources/teach_nitrogen.html)

[http://nitrogenfree.com/problem/nitrogen\\_cycle.php.html](http://nitrogenfree.com/problem/nitrogen_cycle.php.html)