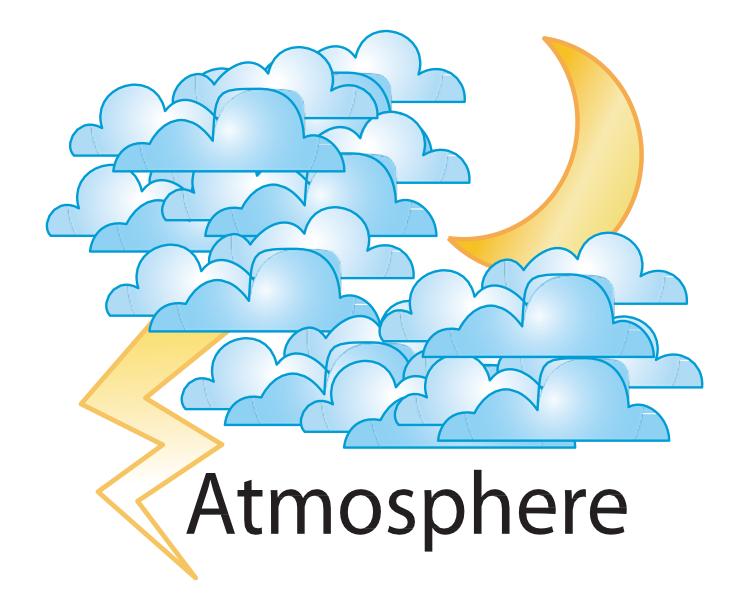
#### Traveling Nitrogen DICE CODES AND RESERVOIR STATION SIGNS

Instructions:

- 1. Hang these dice codes signs at stations around the classroom.
- 2. Equip each station with dice and either, a rubber stamp and ink pad, or, paper stamps from the stamp templates.
- 3. Provide each student with a passport worksheet
- 4. Distribute students so that there are a few at each station
- 5. Then everyone can begin traveling like nitrogen!

Source: The following pages are for the *Traveling Nitrogen* activity from *Windows to the Universe* (www.windows2universe.org)



If your die reads: 1 or 2 (Nitrogen Fixation/<u>Nitrification</u>) Lightning strikes! Nitrogen gas (N<sub>2</sub>) is make into a solid (NO<sub>3</sub>)- Nitrate and travels to the soil!

#### If your die reads: 3

Blue-green algae and bacteria (Nitrogen Fixation/<u>Nitrification</u>) change you into a solid, bringing you to the **soil!** (NO<sub>x</sub>)

**If your die reads: 4** Bean plants **(Legumes)** extract you from the air **(N<sub>2</sub>)** and bring you to the **soil! (Nitrogen Fixation/<u>Nitrification)</u> (NH<sub>3</sub>, NO<sub>2</sub>, NO<sub>3</sub>)** 

#### If your die reads: 5 and 6

Some nitrogen (N<sub>2</sub>) can get into the water in clouds and then fall as **rain**! (NH<sub>3</sub>)- Ammonia (Ammonification)

# Surface Water

#### If your die reads: 1 or 2

You are just the sort of nitrogen that plants need to live.(NO<sub>3</sub>)- Nitrate You are now within a live plant! (Assimilation)

If your die reads: 3 or 4 You travel through the rivers and streams to the ocean! (NH<sub>3</sub>)- Ammonia

If your die reads: 5 or 6 You percolate deep underground in the groundwater! (NH<sub>3</sub>)-Ammonia



If your die reads: 1 You fall into a lake or stream so now you are part of surface water. (NH<sub>3</sub>) Ammonification

If your die reads: 2 or 3 You fall on the land and become part of the soil! (NH<sub>3</sub>) Ammonification

If your die reads: 4 You percolate deep underground in the groundwater(NH<sub>3</sub>) Ammonification

If your die reads: 5 or 6 You rain into the ocean! Ammonification (NH<sub>3</sub>)

## Groundwater



#### If your die reads: Odd numbers (1, 3, or 5)

The groundwater you are dissolved within travels and you become part of the **surface water!** 

#### If your die reads: Even numbers (2, 4, or 6)

The groundwater you are dissolved within travels and you become part of the **ocean**!



#### If your die reads: 1 or 2

You dissolve and wash into the surface water! (NO<sub>x</sub>)

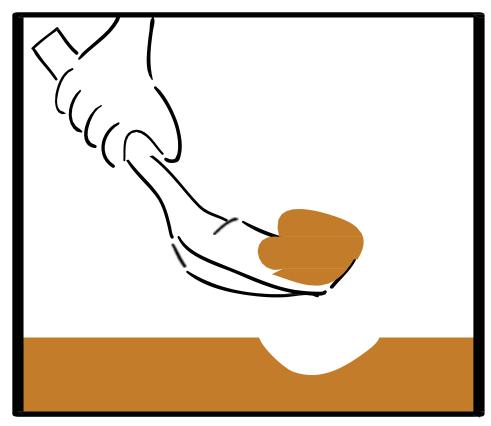
#### If your die reads: 3 or 4

You become part of the soil! (NOx)

#### If your die reads: 5 or 6

You are just the sort of nitrogen that plants need to live. You are now within a **live plant! (NO<sub>3</sub>) Assimilation** 

# Soils



#### If your die reads: 1

You dissolve and wash into the groundwater! (NOx)

#### If your die reads: 2

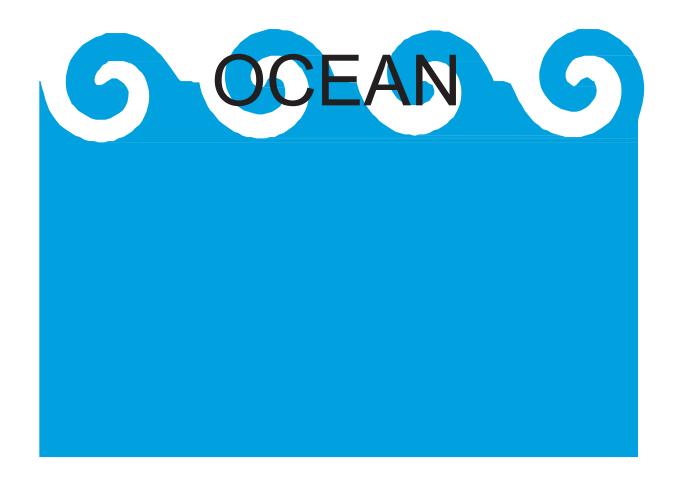
You dissolve and wash into the surface water! (NOx)

#### If your die reads: 3 or 4

You are just the sort of nitrogen that plants need to live. You are now within a **live plant! (NO<sub>3</sub>)- Nitrate (Assimilation)** 

#### If your die reads: 5 or 6

Bacteria have transformed you into nitrogen gas and you are now part of the atmosphere! (N<sub>2</sub>)- Denitrification



#### If your die reads: 1

Look out! Water is on the move! You have washed into the groundwater!

#### If your die reads: 2 or 3

You are just the sort of nitrogen that plants need to live. You are now within a **live plant! (NO<sub>3</sub>)- Assimilation** 

#### If your die reads: 4, 5, or 6

Bacteria have transformed you into nitrogen gas and you are now part of the atmosphere! ( $N_2$ )- Denitrification

# Live Animals

If your die reads: Odd numbers (1, 3, or 5) The animal that you are within has died. (NO<sub>3</sub>) —>(NO<sub>2</sub>)- Denitrification Go to dead plants and animals.

If your die reads: Even numbers (2, 4, or 6)

Congratulations! The animal that you were within has excreted and you are in its waste. Go to animal waste! (NO<sub>3</sub>) —>(NH<sub>3</sub>)- Ammonification

## **Animal Waste**

If your die reads: 1 or 2

Look out before someone steps in you! Now you are decomposing in the soil! (NO<sub>3</sub>) —> (NO<sub>2</sub>)

If your die reads: 3 or 4 A farm supply company has picked you up and made you into fertilizer! (Industrial Nitrification)

**If your die reads: 5 or 6** What's that in the water? You have dissolved into **surface water!** 

### **Dead Plants and Animals**

#### If your die reads: 1 or 2

You are decomposed and become part of the **soil!** (NO<sub>3</sub>) —> (NH<sub>3</sub>) Ammonification

If your die reads: 3 You are decomposed and become dissolved in surface water! (NH<sub>3</sub>)

If your die reads: 4 You are decomposed and become dissolved in the ocean! (NH<sub>3</sub>)

#### If your die reads: 5 or 6

Forest Fire! The wood you were within is burnt and you have been released into the **atmosphere**.  $(N_2)$ - **Denitrification** 

### Live Plants

#### If your die reads: Odd numbers (1, 3, or 5)

The plant that you are within has died. Go to dead plants and animals. (NO<sub>3</sub>) $\longrightarrow$  (NO<sub>2</sub>)  $\longrightarrow$  (NH<sub>3</sub>) (Decomposition)

If your die reads: Even numbers (2, 4, or 6) An animal has eaten the plant that you are within! Go to live animals! (Assimilation)