DICE CODES
Instructions:
- **These pages are for the Traveling Nitrogen activity, which was modified from Windows to the Universe.**
- **Print the following dice code pages.**
- **Cut each reservoir apart.**
- **Place dice codes at appropriate reservoir stations.**

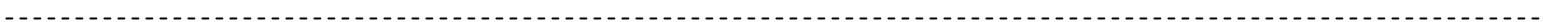| RESERVOIR	POTENTIAL ROUTES
You've arrived at the: **Atmosphere**	If your die reads: 1 Lightning strikes! Nitrogen gas (N_2) is broken and combines with oxygen to form nitrogen oxide. Dissolving in rain, you end up in the **soil**! If your die reads: 2 Blue green algae and bacteria convert you into ammonia (NH_3) bringing you to the **soil**! If your die reads: 3, 4 or 5 Nitrogen gas (N_2) is extracted from the air by **humans**. If your die reads: 6 Bean plants extract you from the air (N_2) and bring you to the **soil** in the form of nitrate (NO_3)!

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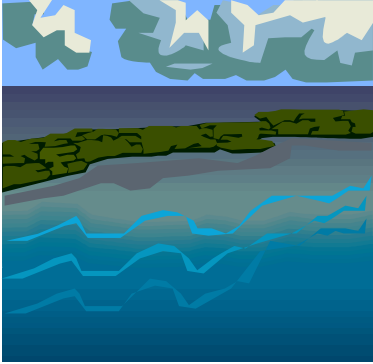| RESERVOIR	POTENTIAL ROUTES
You've arrived at the: **Surface water**	If your die reads: 1 or 2 You are nitrate (NO_3), which plants need to live. You are now within a **live plant**! If your die reads: 3 or 4 You travel through the rivers and streams as nitrate (NO_3) to the **ocean**! If your die reads: 5 or 6 You percolate deep underground as nitrate (NO_3) in the **groundwater**!

RESERVOIR	POTENTIAL ROUTES
You've arrived at: **Rainwater**	<u>If your die reads: 1</u> You fall into a lake or stream as nitrate (NO_3) so now you are part of **surface water.** <u>If your die reads: 2 or 3</u> You combine with rain to become ammonia (NH_3) and then fall on the land and become part of the **soil**! <u>If your die reads: 4</u> You percolate deep underground as nitrate (NO_3) in the **groundwater**! <u>If your die reads: 5 or 6</u> You combine with rain to become ammonia (NH_3) into the **ocean**!

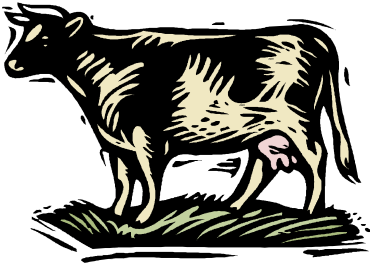| RESERVOIR	POTENTIAL ROUTES
You've arrived at: **Groundwater**	<u>If your die reads: Odd numbers (1, 3, or 5)</u> The groundwater you are dissolved as nitrate (NO_3) within travels and you become part of the **surface water**! <u>If your die reads: Even numbers (2, 4, or 6)</u> The groundwater you are dissolved within (as NO_3) travels and you become part of the **ocean**!

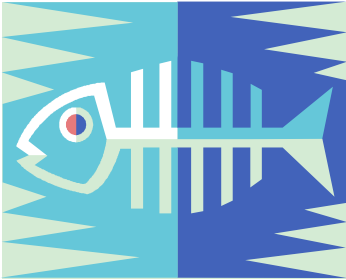| RESERVOIR	POTENTIAL ROUTES
You've arrived at: **Fertilizers**	<u>If your die reads: 1 or 2</u> You dissolve into NO_3 and wash into the **surface water**! <u>If your die reads: 3 or 4</u> You enter the **groundwater** as ammonia (NH_3) because the plant cannot absorb any more fertilizer ! <u>If your die reads: 5</u> You are just the sort of nitrogen that plants need to live: nitrate (NO_3). You are now within a **live plant**! <u>If your die reads: 6</u> You are released as nitrous oxide (N_2O) by denitrification and end up in the **atmosphere.**

RESERVOIR	POTENTIAL ROUTES
You've arrived **at: Soils**	<u>If your die reads: 1</u> You become part of an algal protein and wash into the **groundwater**! <u>If your die reads: 2</u> You dissolve and wash into the **surface water** as nitrate (NO_3)! <u>If your die reads: 3 or 4</u> You are just the sort of nitrogen that plants need to live. You are now within a **live plant** as nitrate (NO_3)! <u>If your die reads: 5 or 6</u> Bacteria have transformed you into nitrogen gas (N_2)and you are now part of the **atmosphere**!

RESERVOIR	POTENTIAL ROUTES
You've arrived at the: **Ocean**	<u>If your die reads: 1</u> Look out! Water is on the move! You have washed into the **groundwater** as nitrite (NO_2)! <u>If your die reads: 2 or 3</u> You are just the sort of nitrogen that plants need to live. You are now within a **live plant** as nitrate (NO_3)! <u>If your die reads: 4, 5, or 6</u> Bacteria have transformed you into nitrogen gas and you are now part of the **atmosphere**!

RESERVOIR	POTENTIAL ROUTES
You've arrived at: **Live animals**	<u>If your die reads: Odd numbers (1, 3, or 5)</u> The animal that you are within has died. Go to **dead plants and animals** as ammonium (NH_4). <u>If your die reads: Even numbers (2, 4, or 6)</u> Congratulations! The animal that you were within has excreted and you are in its waste as urea ($(NH_2)2CO$). Go to **animal waste**!

RESERVOIR	POTENTIAL ROUTES
You've arrived at: **Animal waste**	<u>If your die reads: 1or 2</u> Look out before someone steps in you! Now you are decomposing in the **soil** as NH_4! <u>If your die reads: 3 or 4</u> A farm supply company has picked you up and made you into **fertilizer** as ammonia (NH_3)! <u>If your die reads: 5 or 6</u> What's that in the water? You have dissolved into **surface water** as runoff from excess fertilizer as ammonium (NH_4)**!**

RESERVOIR	POTENTIAL ROUTES
You've arrived at: **Dead plants and animals** 	If your die reads: 1 or 2 You are decomposed and become part of the **soil** as NH_4. If your die reads: 3 You are decomposed and become dissolved in **surface water** as NO_3. If your die reads: 4 You are decomposed and become dissolved in the **ocean** as NO_3. If your die reads: 5 or 6 Forest Fire! The wood you were within is burnt and you have been released into the **atmosphere** as N_2O.

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RESERVOIR	POTENTIAL ROUTES
You've arrived at: **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** as ammonium (NH_4). If your die reads: Even numbers (2, 4, or 6) An animal has eaten the plant that you are within as nitrate (NO_3). Go to **live animals**!

RESERVOIR	POTENTIAL ROUTES
You've arrived at: **Humans** 	If your die reads: Odd numbers (1, 3, 5) You are released as nitrous oxide during the combustion process of a car's engine and end up in the **atmosphere.** If your die reads: 2 or 6 You are assimilated into the human's body as DNA or RNA and stay at **humans**! If your die reads: 4 You are extracted from the atmosphere and turned into **fertilizer** as ammonia (NH_3).