

• ● BIODIVERSITY GIVE AND TAKE ● •

**PURPOSE:** *In this game, students learn about threats to biodiversity and actions that help to sustain biodiversity. Players gain and lose chips according to cards that are drawn during the game. The player with the most chips at the end of the game is the most successful organism. Instructions are included for a physically active version of the game.*

<b>Duration:</b> 45 minutes	<b>Assessment of student learning:</b> Journal response	<b>Ensuring Inclusion:</b> Ability grouping Verbal response to prompt
<b>Fit with Bloom's Taxonomy:</b> Knowledge, Comprehension, Application <b>Fit with Multiple Intelligence:</b> Naturalistic, Linguistic, Visual/spatial		
<p><b>Learning Materials:</b></p> <ul style="list-style-type: none"> <li>• Set of counters (or chips) for each group of students</li> <li>• Deck of playing cards for each group of students (remove face cards and Jokers from decks)</li> <li>• <b>BLM 19:</b> Threats to Biodiversity</li> <li>• <b>BLM 20:</b> Biodiversity Give and Take Game Sheet</li> <li>• Sticky notes</li> </ul>		
<b>Post-Lesson Teacher Reflection:</b>		

**LESSON SEQUENCE:**

1. Review the definition of biodiversity with students. Ask students to work with their elbow partner to brainstorm a list of current threats to biodiversity; students write each threat on a sticky note.
2. Write the four threats to biodiversity on the Smart/black board as headings: habitat loss, climate change, invasive species and pollution. Have students group their sticky notes under the appropriate heading. Hand out BLM 19: THREATS TO BIODIVERSITY for students to put in their portfolio.
3. Divide students into groups of 3-5 players. Give each group a deck of playing cards, a set of chips/markers and a copy of BLM 20: BIODIVERSITY GIVE AND TAKE GAME SHEET.

Explain how to play the game:

- Each player gets 10 chips to start with; the rest of the chips are left in the middle of the table. Place the deck of playing cards facedown on the table.
- The first player draws the top card from the deck of cards, shows the card and looks up the card on the game sheet (BLM 20: BIODIVERSITY GIVE AND TAKE GAME SHEET) and reads the instruction aloud. For example, if the five of diamonds was drawn, the student would read "A Rusty Crayfish invaded a Walleye nest and ate all of the fish eggs. Lose two chips." The player would then put two of their chips back into the centre pile.
- The second player draws the next card from the deck; for example, the two of spades. The player reads the instruction from the game sheet and follows the instruction.
- The game continues for a set period of time (determined by the teacher). The player with the most chips at the end of the game is declared to be the most successful organism.

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### CLOSURE/CHECK FOR UNDERSTANDING:

4. After playing the game, have students respond to the following prompt in their writing journal and add it to their portfolio:

One fact I learned by playing Biodiversity Give and Take is ...

One action I will take to help maintain biodiversity is ...

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### EXTENSION:

Make Biodiversity Give and Take an active game. Rather than using counters or chips, have students take steps forward or backward. In this version, divide students into groups of 6-8 and assign one person to be the Game Master. Students stand in a straight line on a field or gym marking. The Game Master draws a card from the deck of playing cards, looks up the corresponding line on the game sheet,

and reads the instruction inserting "steps" for "counters". The first player carries out the instruction (e.g., takes two giant steps forward). The player who advances forward the furthest by the end of the game is the most successful organism.

## Threats to Biodiversity

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**Threats to Biodiversity:** In part because the value of biodiversity and the resulting ecosystem services are poorly understood by a lot of people, nature's "cogs and wheels" are going missing at an alarming rate — on the order of 100 to 1000 times the background rate, estimated from fossil records to be from one to ten species/year (Pimm, et al., 1995 and others). Some estimates of current rates are much higher. There have been five mass extinctions in the past 500 million years, the most recent about 65 million years ago (Raup and Sepkoski, 1982). We appear to be in the sixth, with the major difference being that for this one, the cause appears to be not a major physical catastrophe such as severe volcanism or a meteor strike, but a single species: us.

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**Habitat loss** and degradation is the leading cause for biodiversity loss. Habitat destruction is widespread in many parts of southern Canada where most Canadians live. Natural habitats that are necessary for species to flourish are converted to roads, building sites, and for industrial or agricultural use. In less populated areas, resource extraction for mining, energy, or forestry may leave poorly functioning ecosystems. In these cases, habitats may be fragmented, which leaves wildlife open to predators and unable to reach feeding and breeding sites. This fragmentation makes it difficult for species to adapt and survive.

**Climate change** affects every Canadian ecozone, but rising temperatures are causing particularly visible damage to arctic environments. When permafrost melts, the ground loses its supporting network of ice crystals. This can destabilize the land and make animal habitat and human infrastructure vulnerable. The warming conditions in the Arctic may force various arctic species to migrate further north in order to survive. They may have to do this at a quicker rate than they are able. It is estimated that species will have to move about one kilometer each year to survive. However, plants such as lichen, an important food source for caribou, are limited in their ability to spread. The inability of plants to adjust quickly could have detrimental effects on animals that rely on them as a food source. The loss of arctic species may be as high as 20 percent. With this potential reduction of species, many benefits of biodiversity are threatened.

**Invasive Species** are organisms that are not indigenous to regions, but have been transported there by human activity or natural occurrences. They are able to thrive in these new areas because they have no natural predators or diseases. Non-native species can damage native environments by altering habitat, competing for resources, causing disease, or by hybridization (interbreeding and altering the gene pool). All these elements throw the ecosystem out of balance and reduce the environment's ability to cope with change.

Dumping products like paint, detergents, and oil down the drain **pollutes** waters and can kill fish, amphibians, and aquatic plants. Proper removal of toxic liquid and other materials like batteries, computers, medications, and electronics should be done with care. Most municipalities provide special depots for these materials to be disposed of safely.

### Sources:

[http://www.eman-rese.ca/eman/reports/publications/rt\\_biostrat/cbs4.htm](http://www.eman-rese.ca/eman/reports/publications/rt_biostrat/cbs4.htm)

[http://www.mnr.gov.on.ca/en/Business/Biodiversity/2ColumnSubPage/STEL02\\_166814.html](http://www.mnr.gov.on.ca/en/Business/Biodiversity/2ColumnSubPage/STEL02_166814.html)

## Biodiversity Give and Take Game Sheet

CARD	ACTION
Ace of clubs	Global warming leads to lower water levels in the Great Lakes which decreases spawning grounds for fish and breeding grounds for birds. Lose two chips.
Ace of spades	You rode your bicycle to school, saving gas and helping to preserve biodiversity. Way to go! Take two chips.
Ace of diamonds	You used a power washer to rinse your Dad's boat after the fishing trip. Great work! Take two chips.
Ace of hearts	After fishing, you took the leftover bait home to freeze it, rather than dumping it in the lake. Good move! Take two chips.
Two of clubs	You slept in, and missed the school bus. Your Mom had to drive you to school. That burns extra gas and adds to climate change. Lose two chips.
Two of spades	You gave up a Saturday to volunteer with a "Project Purple" crew to control purple loosestrife. Take three chips.
Two of diamonds	You planted a native tree to celebrate your Mom's birthday. Take three chips.
Two of hearts	You checked to make sure that no invasive plants were going to be planted in the school garden. Way to go! Take three chips.
Three of clubs	Plants provide food and some common medicines. Losing biodiversity may mean losing future sources of medicine and food. Lose two chips.
Three of spades	Species and ecosystems evolved over thousands and million of years, much of it before humans arrived. The impact of human choices has increased the rate of change dramatically. Lose five chips.
Three of diamonds	You help your dad change the oil on the car and instead of dumping it down the sewer drain, you take it your local Household Hazardous Waste Depot. Take 3 chips.
Three of hearts	You decide to plant the native Blue Vervain in your garden instead of transplanting Purple Loosestrife. Take 2 chips.
Four of clubs	You and your family built a wood duck nesting box and mounted it on a tree near a pond down the road. Take 3 chips.
Four of spades	After painting your bedroom, you dumped the rest of the paint down the drain, which will eventually make its way into nearby lakes and rivers. Lose 3 chips.
Four of diamonds	Instead of turning on the air conditioner, you decided to draw the curtains to keep the warm sun out. Take 2 chips.
Four of hearts	Your family only uses paper plates and plastic cutlery for dinnertime meals. Fewer dishes, but more waste. Lose 1 chip.

Five of clubs	After you discovered Zebra Mussels in the lake at your cottage, you call the Invading Species Hotline @ 1-800-563-7711. Take 1 chip.
Five of spades	You bring your own wood camping this summer and discover that it's infested with Emerald Ash Borers. Lose 2 chips.
Five of diamonds	A Rusty Crayfish invaded a Walleye nest and ate all of the fish eggs. Lose two chips.
Five of hearts	After reading information on invasive species that your teacher gave to you, you pass it on to your uncle Joe. Take 1 chip.

Six of clubs	Instead of using toxic chemicals to clean the bathroom, you use baking soda and vinegar instead. Take 2 chips.
Six of spades	A sea lamprey attacks a Lake Trout. Although the initial bite doesn't kill the fish, it dies three days later from an infection in the lamprey wound. Lose 3 chips.
Six of diamonds	You and your big fuzzy dog run through a patch of Garlic Mustard and brush the seeds off in your backyard before going inside. Lose 2 chips.
Six of hearts	After a long day of fishing you are too tired to deal with the bait and dump it in the lake when your dad isn't looking. Lose 2 chips.

Seven of clubs	Your family is moving to another province and you can no longer keep your goldfish aquarium. You dump the entire contents of the tank into the pond down the road. Lose 1 chip.
Seven of spades	Your family purchases organic vegetables from your local farmer's market. Take 2 chips.
Seven of diamonds	Your family has a yard sale. Someone else's junk is another person's treasure. Take 1 chip.
Seven of hearts	A new subdivision has just gone up down the street and the land has been completely cleared. Lose 3 chips.

Eight of clubs	Your class participates in a city-wide litter clean up project. Take 2 chips.
Eight of spades	You and your classmates do a research project on the biodiversity of the forest behind the school. The more you know, the more you can help. Take 2 chips.
Eight of diamonds	You watch as a friend picks every last native Trout Lily in the forest, leaving none behind to spread their seeds, and you don't say a word. Lose 2 chips.
Eight of hearts	Even though you know that Round Goby is an Invasive Species, they seem to catch the biggest fish and you continue to use them as bait. Lose 1 chip.

Nine of clubs	You decide to cut the length of your shower time in half, saving water and energy. Take 1 chip.
Nine of spades	You convince your mom to wash your clothes in cold water, which uses less energy. Take 2 chips.
Nine of diamonds	Instead of cranking up the heat in the winter, you decide to put an extra sweater on to stay warm. Take 1 chip.
Nine of hearts	You convince your parents to bring their own cloth bags to the grocery store. Take 1 chip.

Ten of clubs	Giant Hogweed has spread into the south end of your city, competing for sun with native plants around it. The Giant Hogweed wins. Lose 2 chips.
Ten of spades	Although Dog Strangling Vine hasn't strangled any dogs, it has strangled out the native plants around it. Lose 3 chips.
Ten of diamonds	Your boat motor gets clogged with a giant mass of the invasive Eurasian Watermilfoil. Lose 2 chips.
Ten of hearts	You enjoy being outdoors and convince three other friends to become a part of your community's outdoors club. Take 2 chips.