

WELCOME TO THE MACRO ENVIRONMENT BOARD GAME! ADVANCED VERSION

Prep time: 10 minutes (printing materials, cutting out cards, setting up game board)

Play time: 10-20 minutes

Number of players: 4 per group

Target grade: 6th through 12th grade

MATERIALS:

- Game board (teacher tip: when printing, select print on both sides and “flip on short end” so cards line up)
- Resource cards (shuffled well) and macroinvertebrate cards
- 1 six-sided dice
- One game piece (could be a coin, monopoly piece, paperclip, etc.)

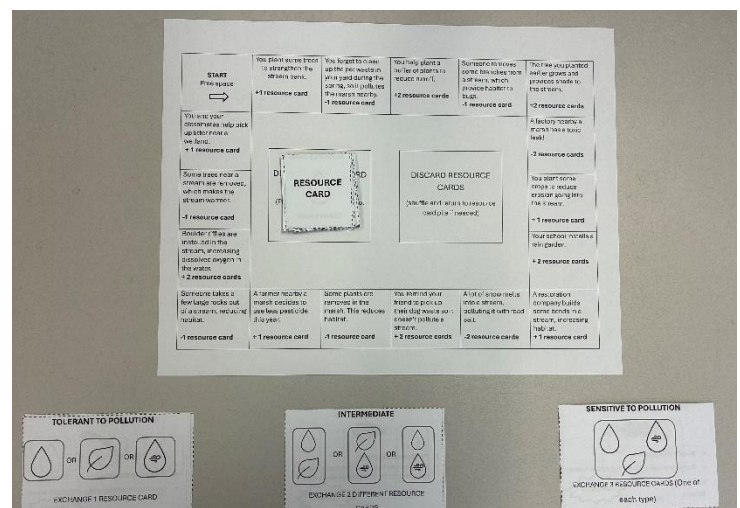
OBJECTIVE:

Learn about how your and your community’s actions can affect a macroinvertebrate community in a waterbody. Work your way around the game board to collect resource cards. Strategize with your teammates to decide when to exchange your resource cards for macroinvertebrate cards. Some macroinvertebrate cards are worth more points than others. The group that has the most points at the end of playtime wins! The most points represents the assembly of macroinvertebrates that you would find in the healthiest ecosystem.

SETUP:

1. Cut out all the cards along the dotted line.
2. Set up your game board and cards. Place your resource cards SYMBOL SIDE DOWN on the game board in the corresponding rectangle.
3. Place your macroinvertebrate cards in 3 piles next to the game board; one pile of “tolerant to pollution,” one pile of “intermediate,” and one pile of “sensitive to pollution.” The side with the resource card symbols should be FACE UP.

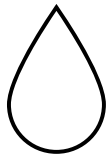
HOW TO PLAY:



Game setup example

1. Designate one player as “Mother Nature.” This player keeps track of the resource cards and exchanges the correct number of resource cards for each macroinvertebrate card.
2. Place your game piece on the free space labeled “start”
3. The player left of Mother Nature will roll the dice first.
4. That player will move the game piece the corresponding number of squares.
5. The player who rolled reads the square they land on aloud to the group. If you land on a minus resource cards for the first turn, do nothing. If you land on a plus resource card square, draw that number of resource cards, read them aloud, and hand them to Mother Nature.
6. Mother Nature should spread the resource cards out on the table so everyone can see them.
7. The next player will roll and repeat steps 4-6.
8. If you land on a minus resource card square, Mother Nature should return that number of resource cards to the “discard resource cards” pile. *You may choose which resource cards you want to discard.* If you run out of cards in the draw pile, shuffle the discard pile and return face down to the draw pile.
9. *AT ANY POINT DURING GAMEPLAY*, you can exchange resource cards for macroinvertebrate cards! Strategize with your teammates how you think you will accumulate the most points in the end.
10. If you decide to exchange resource cards, Mother Nature should place the correct resource cards (corresponding to the resources listed on the macroinvertebrate cards) in the “discard resource cards” pile on the gameboard. For example, if you choose an “Intermediate” macroinvertebrate card, you choose two different resources to place in the discard pile. Then, Mother Nature flips over the macroinvertebrate card and reads it aloud. Save the macroinvertebrate cards for the end of the game.
11. Gameplay continues until your teacher instructs you to stop (teacher tip: setting a 10 – 15 minute timer works well). If you reach the end of the game board before that time, you can go around again.
12. *AT THE END OF THE GAME*, you can exchange all remaining resource cards for macroinvertebrate cards. If you run out of options for macroinvertebrate cards, the remaining resource cards should be discarded.
13. As a group, add up the points on your macroinvertebrate cards to get your ECOSYSTEM SCORE.
 - EXCELLENT MACROINVERTEBRATE ECOSYSTEM: 41+ points
 - GOOD MACROINVERTEBRATE ECOSYSTEM: 21 – 40 points
 - POOR MACROINVERTEBRATE ECOSYSTEM: 0-20 points
14. Optional for teachers: have each group share their score, which macroinvertebrates they earned, and how they strategized as a team to get there.

START Free space 	You plant some trees to strengthen the stream bank. +1 resource card	You forget to clean up the pet waste in your yard during the spring, so it pollutes the marsh nearby. -1 resource card	You help plant a buffer of plants to reduce runoff. +2 resource cards	The city installs pavement that allows water to drain through, which filters it. +1 resource card	The tree you planted earlier grows and provides shade to the stream. +1 resource cards
You and your classmates help pick up litter near a wetland. + 1 resource card	DRAW RESOURCE CARD PILE (Place resource cards symbol side down here) DISCARD RESOURCE CARDS (shuffle and return to draw resource card pile if needed)				A factory nearby a marsh has a toxic leak! -2 resource cards
Some trees near a stream are removed, which makes the stream warmer. -2 resource cards					You plant some crops to reduce erosion going into the stream. + 1 resource card
Boulder riffles are installed in the stream, increasing dissolved oxygen in the water. + 2 resource cards					Your school installs a rain garden. + 2 resource cards
Someone takes a few large rocks out of a stream, reducing habitat. -1 resource card	A farmer nearby a marsh decides to use less pesticide this year. + 1 resource card	The city blocks construction of a metal factory near a sensitive stream. +1 resource card	You remind your friend to pick up their dog waste so it doesn't pollute a stream. + 2 resource cards	A lot of snow melts into a stream, polluting it with road salt. -2 resource cards	A restoration company builds some bends in a stream, increasing habitat. + 1 resource card



CLEAN WATER



OXYGEN IN WATER



ROCKS, LEAVES,
BRANCHES
(HABITAT)



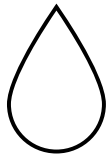
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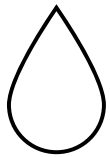
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OXYGEN IN WATER



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RESOURCE CARD

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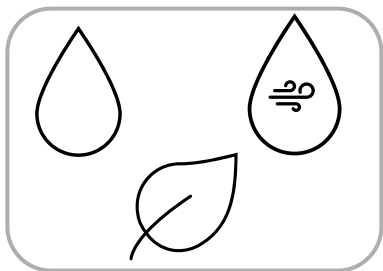
RESOURCE CARD

**RESOURCE
CARD**

RESOURCE CARD

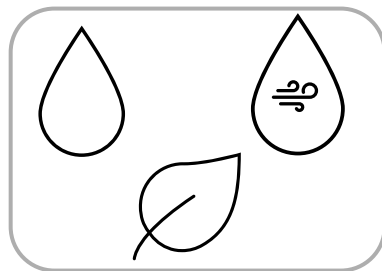
RESOURCE CARD

SENSITIVE TO POLLUTION



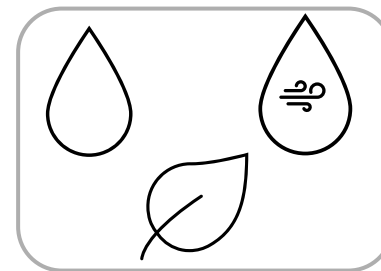
EXCHANGE 3 RESOURCE CARDS (One of each type)

SENSITIVE TO POLLUTION



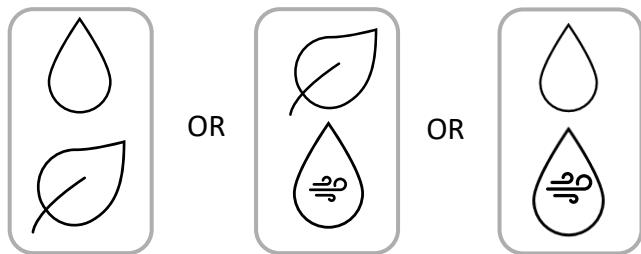
EXCHANGE 3 RESOURCE CARDS (One of each type)

SENSITIVE TO POLLUTION



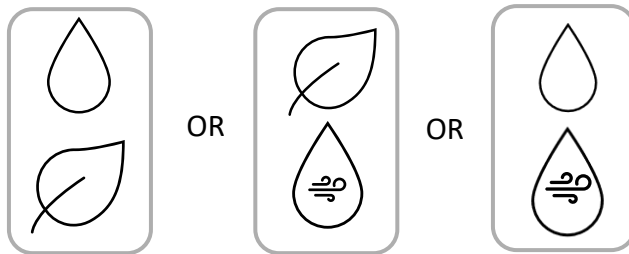
EXCHANGE 3 RESOURCE CARDS (One of each type)

INTERMEDIATE



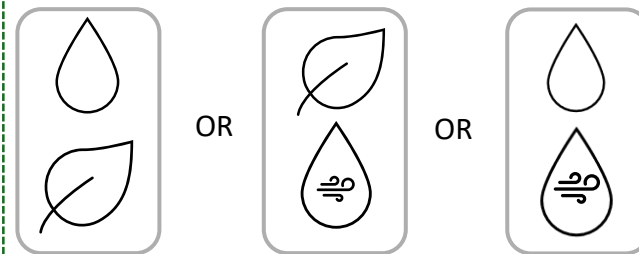
EXCHANGE 2 DIFFERENT RESOURCE CARDS

INTERMEDIATE



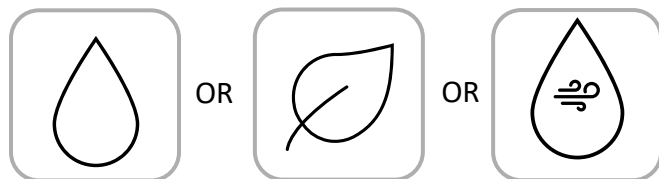
EXCHANGE 2 DIFFERENT RESOURCE CARDS

INTERMEDIATE



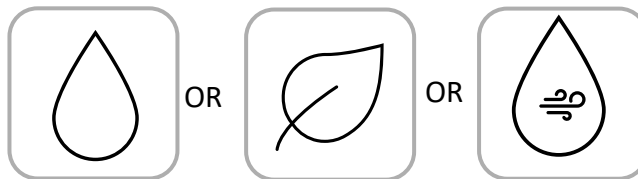
EXCHANGE 2 DIFFERENT RESOURCE CARDS

TOLERANT TO POLLUTION



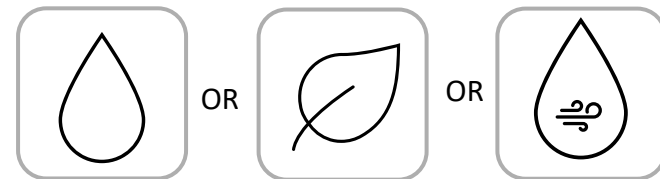
EXCHANGE 1 RESOURCE CARD

TOLERANT TO POLLUTION



EXCHANGE 1 RESOURCE CARD

TOLERANT TO POLLUTION



EXCHANGE 1 RESOURCE CARD

MAYFLY LARVAE



- **Sensitive to pollution**
- Some swim like a dolphin (up/down motion)
- Prefer clean, cold streams

10 POINTS

STONEFLY LARVAE



- **Sensitive to pollution**
- Some like to eat leaves
- Prefer clean, cold streams

10 POINTS

CASEMAKING CADDISFLY LARVAE



- **Sensitive to pollution**
- Build “cases” which are like houses made of rocks, leaves, and other materials
- Prefer clean, cold streams

10 POINTS

DRAGONFLY LARVAE



- **Moderately Sensitive**
- Some species spend over 1 year in the water as larvae

5 POINTS

CRAYFISH



- **Moderately sensitive**
- Will eat almost anything, even live fish if they can catch one!

5 POINTS

BEETLES



- **Moderately sensitive**
- Many species have hairs that trap air near their body for them to breathe underwater

5 POINTS

LEECH



- **Tolerant to pollution**
- Common in warmer water and urban areas

2 POINTS

SCUD



- **Tolerant to pollution**
- Some species are common in urban streams and mucky streams

2 POINTS

AQUATIC WORM



- **Tolerant to pollution**
- Most common in sandy and urban streams

2 POINTS