Invasive Species

Aliens Are Taking Over Our Rivers!

A species usually does not occupy all the areas where it could grow. Boundaries such as mountains, rivers, oceans, and deserts stop the spread of organisms into areas that have suitable habitat. Now with the help of globetrotting humans, those geographic obstacles can be easily hurdled. Species have been jumping over boundaries with human assistance, both deliberate and accidental, and becoming alien entities in a new "world." We find plants from Africa in Hawai'i, birds from Europe in Oklahoma, and fish from China in Wisconsin.

If the habitat is right, alien species can survive and thrive in their new home. The alien species may reproduce and spread rapidly over the landscape if there are few competitors and predators in the new region. When this occurs, we may consider the alien to be invasive. Just because a species is not native doesn't mean that it will become invasive. Invasive species compete for space and resources with other species. Invasive species can take over an area because they are often good at producing many offspring and do not require a special habitat. By spreading and taking over areas in which native species live, invasive species can reduce biodiversity in an area. In fact, invasive species may be one of the biggest factors in the reduction of biodiversity around the whole world!

Not only do alien, invasive species have an environmental impact, but they have an economic effect as well. It is estimated that more than $136 billion is spent each year in the United States to manage invasive species. Finding and getting rid of invasive species before they become a major problem helps to reduce the money spent fixing the problem and the environmental damage done.

Wading Deeper - Tamarisk Along the Prairie Rivers

Many invasive species thrive in and along rivers. The waterway and associated riparian habitat can become a corridor for invasive species dispersal. Tamarisk, or salt cedar, is highly invasive along rivers in the western United States. Tamarisk (*Tamarix* species) was introduced from Europe and Asia to be grown in wind breaks, create shade in treeless areas, stabilize eroding stream beds, and be grown in gardens and yards as an ornamental shrub. Tamarisk prefer moist areas and grow primarily along waterways, even in salty water.

Tamarisk have spread along many rivers in western Oklahoma, including the Salt Fork of the Arkansas River, and taken over areas in the Great Salt Plains in north-central Oklahoma. Not only are they very invasive, growing in dense monocultures, but they also use a lot more water than native plants. This reduces the water available to native species and increases the salt concentration in the soil. Many native species cannot tolerate the drier, saltier soil. Tamarisk has changed the ecosystem by changing the soil chemistry.

The small plants in the foreground of this picture are newly sprouted tamarisks. Patches like this pop up on sandbars after flooding events.

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Activity - Competition for Space: Alien vs. Native

You have an artificial landscape that is ready for colonization by three plant species. You may imagine that your landscape is an open sandbar recently scoured by flood waters. One plant species able to colonize the landscape is considered invasive in riparian systems, tamarisk. One species is common in the area, but doesn't usually dominate over other species, Maximillian sunflower. The last species is rare to sandbars and generally is only found is small patches, partridge pea. The colonization of the sandbar will be based on the reproductive potential of each species and the environmental conditions on the sandbar.

Take a large poster board and draw on it a grid of approximately 200-300 cells (small groups can use graph paper instead). The grid represents the landscape within which species can spread.

For your three species, you will need 3 sets of 200 markers that can be placed on the grid (such as 3 different kinds of beads, bingo markers, beans, paper cut outs - paper hole punches work well for graph paper grids). Divide your class into three groups and give each group one set of "species" markers.

Each group places one individual on the grid at the beginning. They may chose to locate it anywhere on the grid.

Each group takes a turn rolling the die to obtain a number representing the variation in environmental conditions that affect reproduction of plants - such as rain fall, temperature, birds eating seeds, etc… A roll of 1 indicates less suitable conditions and 6 indicates highly suitable.

After a group rolls the die, that number is multiplied by its reproductive potential and rounded up.

Invasive species has a reproductive potential of 1.3
Common native species has a reproductive potential of 1
Rare species has a reproductive potential of 0.5

The number represents the offspring for each "parent" and that number of markers should be added to the grid adjacent to each "parent" plant. For example, if the invasive group rolls 3, then they multiply 3 x 1 (their first individual on the board) x 1.3 = 3.9 and rounded up = 4. Four invasive markers will be added to the grid. You may use the table to keep track of your data. Each group gets a turn in each round.

In round 2, the invasive group has 5 individuals on the grid. They roll a 4 again and do the following calculation: 4 (environment suitability) x 5 (individuals on grid) x 1.3 (reproductive potential) = 26. Then they add 26 markers adjacent to any of the other invasive markers. When the grid is full, the game is over.

Before the Activity:

Generate at least two hypotheses to test based on what you know about your species, the landscape, and environmental variability. Here are some things that you might consider:

- Which species will spread fastest and why?
- What will happen when species meet?
- How would a barrier affect the colonization of an old field, such as a rock wall or abandoned tractor?
- How will the variation in environment (rolling the die) affect the colonization?

Variations:

How do these variations change the game?

- Place the first individuals in a different location.
- Try adding geographic obstacles that might limit the spread of species.
- At the beginning, put more than one individual of the rare species on the board.

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Competition for Space Worksheet

		Invasive	Common Native	Rare Native
1	# of reproducing individuals for Round 1	1	1	1
2	Reproductive Potential	1.3	1.0	0.5
3	Environmental suitability (number from die)			
4	# of individuals added to grid (line 1 x line 2 x line 3)			
5	# of reproducing individuals for Round 2 (line 4 + line 1)			
6	Reproductive Potential	1.3	1.0	0.5
7	Environmental suitability (number from die)			
8	# of individuals added to grid (line 5 x line 6 x line 7)			
9	# of reproducing individuals for Round 3 (line 8 + line 5)			
10	Reproductive Potential	1.3	1.0	0.5
11	Environmental suitability (number from die)			
12	# of individuals added to grid (line 9 x line 10 x line 11)			
13	# of reproducing individuals for Round 4 (line 12 + line 9)			
14	Reproductive Potential	1.3	1.0	0.5
15	Environmental suitability (number from die)			
16	# of individuals added to grid (line 13 x line 14 x line 15)			
17	# of reproducing individuals for Round 5 (line 16 + line 13)			
18	Reproductive Potential	1.3	1.0	0.5
19	Environmental suitability (number from die)			
20	# of individuals added to grid (line 17 x line 18 x line 19)			
21	# of reproducing individuals for Round 5 (line 20 + line 17)			
22	Reproductive Potential	1.3	1.0	0.5
23	Environmental suitability (number from die)			
24	# of individuals added to grid (line 21 x line 22 x line 23)			

Questions for Discussion:

1. Which species spread across your artificial landscape most quickly? Why?
2. Invasive species compete with native species for resources and living space. Do your results indicate that your invasive species was a superior competitor for space?
3. Graph the number of individuals on the grid after each round for each species. How do the graphs differ for each species?
4. If you planted a highly invasive species in your backyard, what do you think would happen?
5. Would invasive plants do better in environments that people inhabit or in wild places? Explain your answer.
6. Would you get the same results every time you do the activity? Why or why not?

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