The Race for Space![1]

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Invasive Species Series

The Race for Space!

Sneak Peek

Students will be introduced to concepts and issues surrounding invasive species. One specific invader in Tampa Bay is the Asian Green Mussel. Students will compare how fast green mussels invade living space normally occupied by native species. This activity incorporates mathematical calculations, graphing, data analysis, and environmental investigations.

Aligned with the following Sunshine State Standards and FCAT Benchmarks for grades 6-8.

SC.D.1.3.3 CS	SC.F.2.3.3 CS
SC.D.1.3.4 AA	SC.G.1.3.2 CS
SC.F.1.3.1 AA	SC.G.1.3.4 AA
SC.F.1.3.7 CS	

AA=annually assessed
CS = content sampled

Objectives:

Students will…

- Calculate exponential growth.
- Formulate data to display species growth in limited living space.
- Analyze data and graph results.

photographs from USGS

Materials:

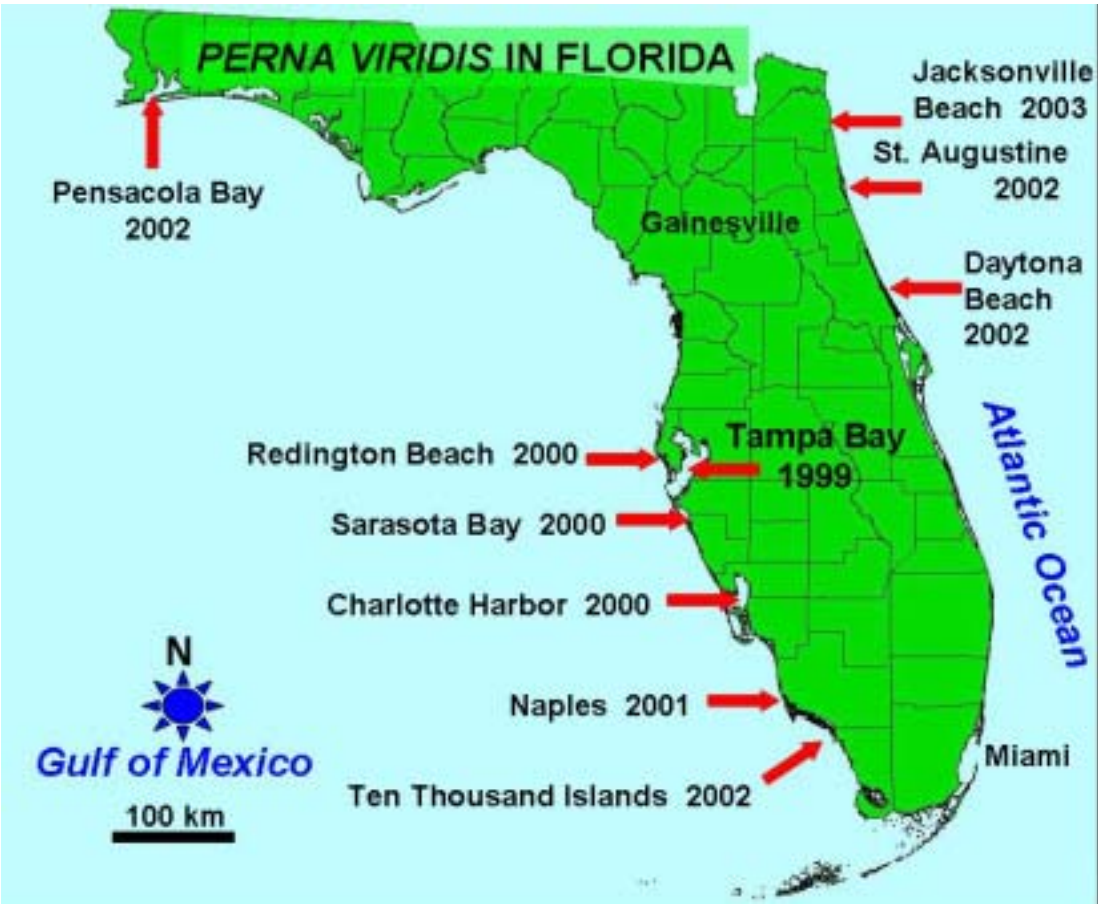
- Pencil.
- Calculator.
- Graph paper.
- 200 blue M&Ms, 200 red M&Ms, and 200 yellow M&Ms per group (other small items may be substituted, such as colored toothpicks, buttons, pipe cleaners, craft beads, etc.).
- 10 cups per group.
- 1 die per group.

Background:

Invasive species are plants or animals that are not ***native*** to a particular area and cause harm, often by disrupting natural ecosystems. There are many invasive species thriving in Florida. Invasive species may compete with native species for food and living space. A successful ***invader*** will take over space in which a native species would normally live. Eventually, invasive species may cause a loss of ***biodiversity*** by reducing the number of species found in a given area.

Mussel Explosion!

The introduction of a plant or animal does not necessarily mean it will thrive in that environment. The success of an ***aquatic*** invader depends on many factors including water temperature, pH, currents and water level. One important factor is reproductive rate. A thriving invader typically has a high reproductive rate. The Asian Green Mussel is an invasive species with a high reproductive rate. It was first discovered in Tampa Bay clogging the insides of cooling water intake pipes at a power plant during the summer of 1999. The Asian Green Mussel's current known distribution includes Tampa Bay, the west coast of Florida south to the Everglades, the Panhandle, and northeast Florida to southern Georgia. These mussels may limit biodiversity in the Tampa Bay area and elsewhere.



Change in the distribution of Asian Green Mussel (*Perna viridis*) over time.

Note: As of December 2006, the report from Pensacola Bay is not considered valid. It appears to have been a misidentification. This update provides evidence of the need for further valid information on invasive species.

Rules of the Race:

1. Separate the class into groups of three or six. Each group should form three teams representing three different species. Each team should have 200 of the same colored M&Ms or other substituted object. Place ten cups in front of each group.

2. Team one has a survival factor of 1.25
   Team two has a survival factor of 1.0
   Team three has a survival factor of 0.75
   **The survival factor is the ability of each species to reproduce successfully. Team one represents Asian Green Mussels. Team two and Team three are native species. Students can pick a native bivalve species such as the Bay Scallop or Eastern Oyster.*

3. Each team takes turns rolling the die. This number represents how favorable the environment is for their species, with one being least favorable and six being most favorable.
   **The number on the die represents variable changes in the environment, such as changes in pH, temperature, food availability, etc.*

4. Each team has one representative from their species to start. After a member of the team rolls the die, multiply that number by the survival factor and the result by the number of individuals reproducing. For the first roll, the number of individuals reproducing is one.

5. After a team calculates the final number, round up to the nearest whole number and place that many M&Ms in any cup. The cup represents living space. **Only 20 individuals of any species can live in one cup! When a cup has 20 M&Ms in it, the team must move to another cup.**

   Example:

   Team one rolls a 4 on their first turn. Multiply 4 x 1.25 x 1 = 5. Team one then places 5 M&Ms in any cup or cups. Team one will have 5 individuals reproducing in the next round.

The next time team one rolls, they get a 2. Multiply 2 x 1.25 x 5 = 12.5 (13). Thus, team one places 13 M&Ms in any cup or cups. **Remember only 20 M&Ms per cup!*

6. Record all numbers in the attached table.

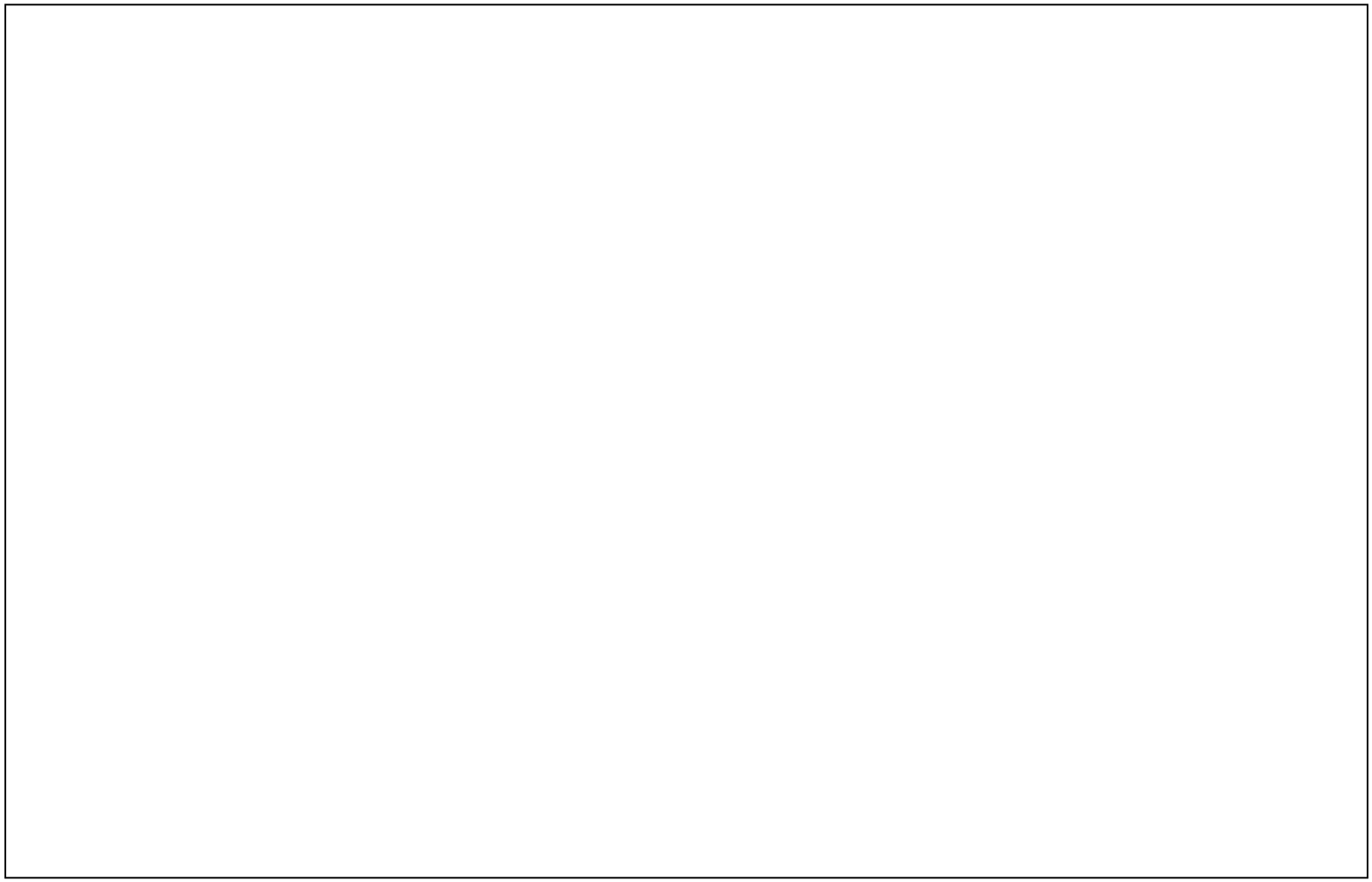
7. Once there are 20 M&Ms in every cup, the race is over! The living space is gone!

OF REPRODUCING INDIVIDUALS x SURVIVAL FACTOR x ENVIRONMENTAL FAVORABLENESS

	TEAM 1	TEAM 2	TEAM 3
# of reproducing individuals for Round 1	**1**	**1**	**1**
Survival factor	**1.25**	**1.0**	**0.75**
Environmental favorableness (off die)			
# of individuals for cups			
# of reproducing individuals for Round 2			
Survival factor	**1.25**	**1.0**	**0.75**
Environmental favorableness (off die)			
# of individuals for cups			
# of reproducing individuals for Round 3			
Survival factor	**1.25**	**1.0**	**0.75**
Environmental favorableness (off die)			
# of individuals for cups			
# of reproducing individuals for Round 4			
Survival factor	**1.25**	**1.0**	**0.75**
Environmental favorableness (off die)			
# of individuals for cups			
# of reproducing individuals for Round 5			
Survival factor	**1.25**	**1.0**	**0.75**
Environmental favorableness (off die)			
# of individuals for cups			
# of reproducing individuals for Round 6			
Survival factor	**1.25**	**1.0**	**0.75**
Environmental favorableness (off die)			
# of individuals for cups			
# of reproducing individuals for Round 7			
Survival factor	**1.25**	**1.0**	**0.75**
Environmental favorableness (off die)			
# of individuals for cups	**o**		
# of reproducing individuals for Round 8			
Survival factor	**1.25**	**1.0**	**0.75**
Environmental favorableness (off die)			
# of individuals for cups			

# of reproducing individuals for each round = number of individuals placed in cups after the preceding round

GRAPH



Rapping It Up!

1. Which species occupied the most living space? Why?

2. Invasive species compete with native species for food and living space. Is there evidence in your results to suggest the Asian Green Mussels did this? *Hint: If there were no Asian Green Mussels how would your results have changed?*

3. Graph the number of individuals you had for your species for each turn. Does your graph differ from the graphs of your opposing teams? How?

4. What are the connections between this activity and life in Tampa Bay?

5. What existing environmental factors may cause the invasive Asian Green Mussels to reproduce more successfully than similar native species?

Glossary:

Aquatic – Living or growing in, on or near water.

Biodiversity – The variety of plant and animal species present in an ecosystem.

Invader/Invasive species – A plant or animal that is not native and causes harm, including disrupting natural ecosystems.

Native species – A plant or animal species that originated in a certain place. A species occurring in its natural range. Species that were present in Florida at the time the first Spanish settlers arrived.