Title of Unit: Invasives Arrive (But What Are They? and Why Do They Come ?)

Name of Teacher: George Profous

Grade Level: 3-6

Unit Overview:

Everything in the world is connected (interrelated) to everything else - trade, food, weather, pollution, people and history. We are apart of the natural world **(biosphere)** and studying invasive species is a good way to illustrate how everything is connected by applying the principle geographic themes of **location, place, human environment** and **interaction**, and **movement**.

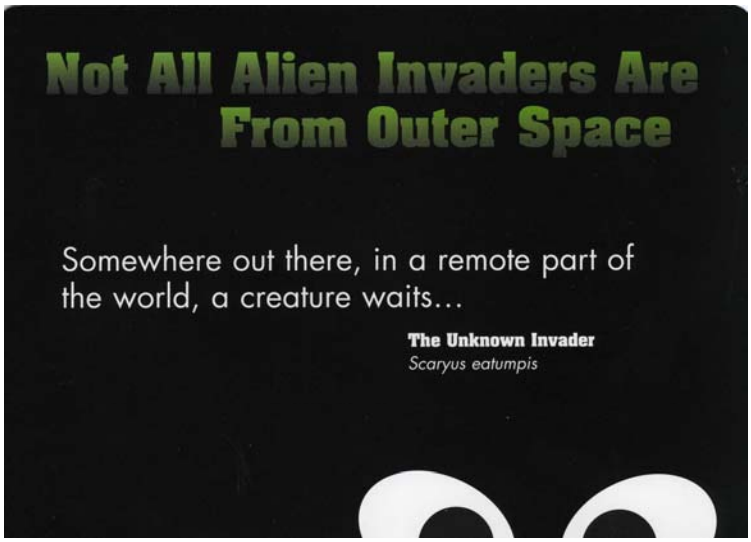
In the past, explorers and settlers brought with them plants and animals - either on purpose or accidentally-from other parts of the world. Some of these became ***invasives***. Today, as travelers and consumers, we often unknowingly help move elements of the biosphere from one part of the world to another with often unforeseen results. Most of these species which came with the European settlement of the United States beginning about 400 years ago, have now been around so long we accept them as belonging here - earthworms, dandelions, rats, cockroaches, pigeons, starlings, house sparrows, brown trout, daylilies, Japanese beetles and chickenpox - to name only a few. Others have arrived lately and sometimes make headline news. The **"Un-wanted Invasives " brochure** which is part of this unit provides more samples.


Dandelion: White man's footsteps

What are non-native species, especially invasive plants and animals from other lands? Where are they from, how do they get here, and what can happen when they are not stopped ? These are questions which will be answered by activities and students working in small groups to answer these questions.

This unit presupposes a prior knowledge of the following terms: continents, climate, country, travel, and species. Students should know the locations of the seven continents and some of the major countries and climates in different regions of the world. As an introduction, you might use the **Movement of People, Plants and Animals Graphic Organizer** to tie-in invasive species (Science) to the study of explorers and settlers (Social Studies). Or, you might ask students about where the things they buy come from, about their family travels, or even their family origins. **Where's That From?** can be used as a take home exercise to begin making connections between trade, movement and invasives.

The Animal and Plant Health Inspection Service (APHIS) puts out a an excellent poster and 15 invasive cards entitled "Not All Alien Invaders Are From Outer Space."



The invasive species brochure, **Un-wanted Invasives - What are They?** and **Guide** (attached) can be used to involve students in getting answers to initial questions that might come up. There is no need for a teacher to know much about the topic. Students then research an invasive species of their choosing (**A list of suggestions is provided**) and share their findings by creating a poster or choosing another method of presentation.(You are welcome to use the **Invasive Species Research Project Sheet**).

The unit culminates in **The Invasive Arrive Board Game.**

Possible extension activities are suggested:

1. A field trip on the school grounds or into the community to experience first-hand how invasives are everywhere.
2. A discussion of the painting "The First Thanksgiving" by Jennie Brownscombe.
3. The Cats and Rats of Pitcairn Island from the Pitcairn Islands Study Center (7/21/2000)
4. The Italian Snail Scenario
5. Jeapardy Invasives Game
6. Graph Reading

Approximate length of time: Five 45 min-1 hour lessons. (plus board game and extensions).

National Geography Standards:

Theme: *The World in Spatial Terms*
Standard 3: How to analyze the spatial organization of people, places and environments on earth s surface.
Theme: *Human systems*
Standard 11: Patterns and networks of economic interdependence on earth's surface

New York State Social Studies Standard 3.1 (Geography):
Students will use a variety of intellectual skills to demonstrate their understanding of the geography of the interdependent world in which we live - local, national and global. Students will locate places within the state and nation, as well as the Earth s continents. Students will investigate how people depend on and modify the physical environment.

Science Standards

Standard 7 - Students will apply the knowledge and thinking skills of mathematics, science and technology to address real-life problems and make informed decisions.

English Language Arts Standard

Standard 3 - Students will read, listen, write and speak for critical analysis and evaluation.

Objectives:
Students will:

- Understand the terms introduced species, invasive species and exotic species.
- Recognize the different ways in which goods and services (trade and travel) provide a vehicle for the movement of invasive species.
- Examine where invasive species come from (ecosystem, climate and location). Make connections between similar climates and the increasing likelihood of introducing invasive species.
- Recognize how introduced species can spread, become invasives, and create problems in their new environments.
- Understand that we depend on non-native plants for food, medicines and other benefits.

Materials

- 1. Poster and cards: All aliens are not from outer space.
- 2. Chart, 11 by 17 paper, Markers, crayons, paint, atlases (10), world map, globe
- 3. Handouts provided include: Where's That From?, Un-Wanted Invasives brochure, Invasive Species Research Project, and Invasives Arrive Board Game.
- 4. Starter research materials can be provided from various sources for invasive species students may wish to choose from on the research list.
- 5. Extension exercise handouts.

Teacher Resources:

Internet web sites:

www.sprl.umich.edu/GCL/notes2/introspp.htm (Introduction to global change II - lecture notes: Notes on introduced species.
www.gcrio.org/CONSEQUENCES/vol2no2/artisle2.htm (Impacts of Introduced Species in the United States
www.aphis.usda.gov/ (Animal and Plant Health Inspection Service. Location of poster and 15 invasive cards entitled Not all Alien Invaders are From Outer Space)
www.ipcnys.org (New York Invasive Plants Council)
www.ucsusa.org (Invasive species legislation, information and National Aquatic Invasive Species Act)
www.invasivespecies.gov/ (Government web site)
http://tncweeds.ucdavis.edu/links.html (The Nature Conservancy site with links to state, regional and international information)
www.ceris.purdue.edu , http://nas.er.usgs.gov/, www.na.fs.fed.us/, (Invasive species profiles: e.g. zebra mussels, Chinese water chestnut, Japanese beetle, Asian long-horned beetle, hemlock wooly adelgid, gypsy moth...etc.)
www.esa.sdsc.edu/invas3.htm (Ecological Society of America: Invasive species information)
www.alienexplorer.com (Norway rat and cockroach information)
http://www.nrri.umn.edu, http://nationalgeographic.com (worm information)
www.abcbirds.org (How cats impact small mammals, reptiles, birds, amphibians and insects)
http://sun.science.wayne.edu/ (Zebra mussels frequently asked questions)

However, sites are always changing, so using key words, such as invasives or actual plant or animal names yields good results (See 'Un-Wanted Invasives' brochure for ideas).

Books:

Mills, E., Scheverell, M., Carlton, J., Strayer, D. (1997). Biological invasions in the Hudson River Basin. *NY State Museum (Circular No. 57)*: Albany. 51 pp.

Van Driesche, R. & Van Dreische, J. (2001). Guilty until proven innocent - Preventing nonnative species invasions. *Conservation Biology in Practice 2(1)*:8-17.

Kim, C. (2001). Biodiversity - Our living world: Your life depends on it. Center for Biodiversity Research. Penn State University: 16 pp.

Invasive Plants Council of NYS. (2002). Invasive Plants - A New York State Issue. Troy: 50 pp.

Newspapers and Magazine examples:
Perez, L. and Sisk, R. (2002). Fierce fish dragnet - Chinatown monster loose. Daily News (July 13, 2002): New York. 1 pp.
Loomis, B. (2003). Facing invader, some favor killing part of Chicago River. The Associated Press (January 16, 2003). (article on Asian carp)
Stager, C. (2003). Stronger than dirt: How duff-munching worms are changing the Adirondack Woods. Adirondack Life (March/April 2003): 14-15.

Government Agency:

U.S. Fish and Wildlife Service (Re: impacts and distribution of several Asian carps.)

Procedures/Strategies:

1.) Cooperative learning group model.

2.) Class group instruction for introduction. Individual for homework: "Finding World Trade Objects" at home. Extension: Cooperative groups of 4 in playing the "Non-natives arrive" board game.

3.) Implementation Strategies/Phases:

Day 1 : Introduction

Children will be asked where they or their family have traveled. This information, gathered in a group discussion, is listed on a chart, placing the countries under the corresponding continents by either the teacher or one or two designated helpers. The information is used as an example of the movement patterns and economic interdependence which help in the spread of invasive species. The chart will be referred to throughout the lesson/unit.

Invasive stories may be read from **Not All Alien Invaders are from Outer Space.** The cards from this series can also be used by children in their study. I chose the Giant African Snail and Brown Tree Snake as a poignant introduction. With mention that plants are just as big a problem.

Students take home "**Where's That From?** " for homework.

Day 2 : Development

1. "**Un-Wanted Invasives-What Are They** " brochure and **Guide Questions** is distributed and class is given time to work through the brochure. The class then discusses the questions in the **Guide.**

2. Student "**Where's That From?**" worksheets can be collected and summarized by the teacher or students may be asked to individually list the items they found on a chart in the class. The items they found will be grouped on a graph by country or continent of origin. The class discusses what they found. Could having things from all over the world in our homes affect the movement of invasive species? What affect might increasing global trade have on the movement of plants and animals into new areas? Do the non-native plants and animals which cause problems have anything in common ? (For example; Are they from areas of similar climate ?). How can we stop the movement of exotics/invasives and be more careful about their coming to the United States and elsewhere in the world ?

Giant African Snail, *Achatina fulica* (Bowdich)

Scientists consider the giant African snail to be one of the most damaging land snails in the world. Luckily, it has not established a foothold in the continental United States, even though that almost happened at least twice. Originally from an area south of the Sahara in East Africa, this snail has established itself in Asia and the Indo–Pacific Islands, including Hawaii. The two near misses took place in California just after World War II and in Miami, FL, in 1966.

In the Florida incident, a young boy returning from Hawaii smuggled three giant African snails into Miami as pets. His grandmother eventually released the snails into her garden. Seven years later, more than 18,000 snails had been found along with lots of eggs. It took the State of Florida almost 10 years and cost more than $1 million to rid itself of this slow but persistent pest.

Compared to our native snails, this foreign pest is really big—about 8 inches (200 mm) long overall with the shell making up half its length. It is also showy, with a light-brown shell striped with brown and cream bands.

Two qualities make this tropical snail especially dangerous here. First, it can survive cold conditions and even snow by aestivating. This means that the snail will become slow and sluggish, essentially hibernating until warm weather returns. Theoretically, it could live in most of the United States.

Second, the giant African snail is a whiz at reproduction. For one thing, each snail contains both female and male reproductive organs! After a single mating session, each snail can produce a batch of 100 to 400 eggs. And it can keep this up several more times without having to mate again. In a typical year, every mated adult lays about 1,200 eggs. Giant African snails can live as long as 9 years, and that is plenty of time to cause trouble in the local environment.

One of the threats posed by the giant African snail is not what it eats, but what it carries. This pest can be a vector for human diseases such as eosinophilic meningitis. This disease is passed along by rat lungworm parasites that can be found on the snail. If the snail is eaten raw or isn't completely cooked, diners eating giant African snails might get the rat lungworm parasite as a side dish without knowing it—and meningitis for dessert.

Another threat is the voracious snail's appetite. It is known to eat at least 500 different types of plants, including breadfruit, cassava, cocoa, papaya, peanut, rubber, and most varieties of beans, peas, cucumbers, and melons. Unlike people, giant African snails are never picky eaters. If vegetables or fruits are not available, the snails will munch on a wide variety of ornamental plants and even tree bark. All the world's a buffet table to this snail.

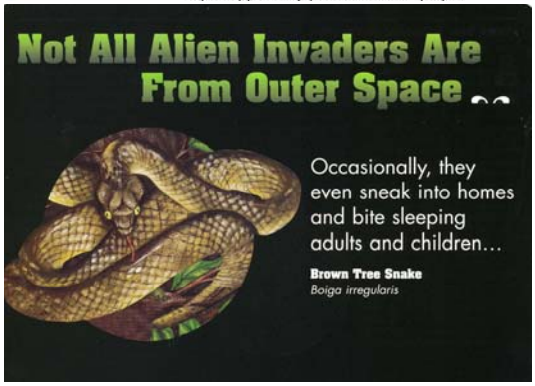
United States Department of Agriculture
Animal and Plant Health Inspection Service

Program Aid 1665

Other species on the cards are:

Asian Longhorned Beetle
European Green Shore Crab
Gypsy Moth
Leafy Spurge
Fruit Flies
Purple Loosestrife
Red Fire Ant
South American Nutria
Spotted Knotweed
Tropical Bont Tick
Zebra Mussel
Yellow Starthistle

USDA Animal and Plant Health Inspection Service Program Aid 1665



3. A list of invasive species can be provided for students to chose from for a **Research Project** (See Appendix). (Optional: An invasive species box can be provided and students may choose one of these or another species found near the school or locally, to research.) Once students have chosen a species, they will be asked in groups of 2-3 to research information on the species. Discuss the questions which need to be answered and list on a chart or blackboard. A handout with guiding questions is provided with room for a picture or sketch (**See**: **Invasive Species Research Project)** .
4. As a group, discuss and review the types of materials available to researchers as they search for answers (internet, encyclopedia, books, libraries, atlases, dictionaries, videos). Students start as a group and students are assigned or choose questions to research and have a clear role. Students can be assigned questions:

Example :

Student # 1:
1. What does the species look like ? (sketch, photocopy or photograph should be provided)
2. Where did the species come from ? (Location of origin-absolute and relative, if information available).

Student # 2:
3. How did the species come to be here?
4. How does it spread?

Student # 3:
5. Where is it in the United States now? Is it found in a certain region ? Why ?
6 . What affect does it have on us/our neighborhood/ our state ?

All students:
7. Any ideas on how it could have been stopped before it got started in America ?

Alternative tasks and assessments are provided in the appendix to accommodate different learning styles (See task rotation assessment)

Day 3 : Students continue their research and prepare a poster/summary for presenting to the class.

Day 4: Presentation Student groups share their research project with the class. Each group will present for perhaps 5 minutes, including time for 1-2 questions from the class.

Day 5 (15 min)

The Non-natives Arrive Board Game rules are introduced. Children are given the option to play the game during free-time, science or social studies activities or subsequent lessons. An invasives playoff can be scheduled between teams. (Cooperative groups of up to four students can take turns playing the game or 5 copies of the game can be made and an 'invasives playoff' held on Day 5). **(SEE The Invasives Board Game)**
Note: After playing the game at their own pace, children can be asked fort their observations and advice on how they think the game might be improved. Concepts such as invasive impacts on natural ecosystems and communities also dovetail well with the science curriculum.

Extensions:

- Graph Reading (Doing the graph interpretation worksheet attached).
- Analysis of non-native species spread patterns on maps. (mathematics)
- Field trip to area adjacent to school (meadow, lawn, woods, street-scape, etc to find non-native species). Can document with camera, camcorder, sketches. Also, to local nature center or state natural resources agency to speak to scientists..
- Jeopardy Game **(SEE cards attached)**
- A school day featuring animals or plants now extinct in New York State. The theme can be weird creatures or visitors from far-away lands - good or bad. . Perhaps adding poisonous creatures, poisonous plants, imported or native. (e.g. American toad toxins, monarch butterfly toxins, poison ivy, giant hogweed, Chinese northern snakehead fish, short-tailed shrews and their venomous saliva...etc.)

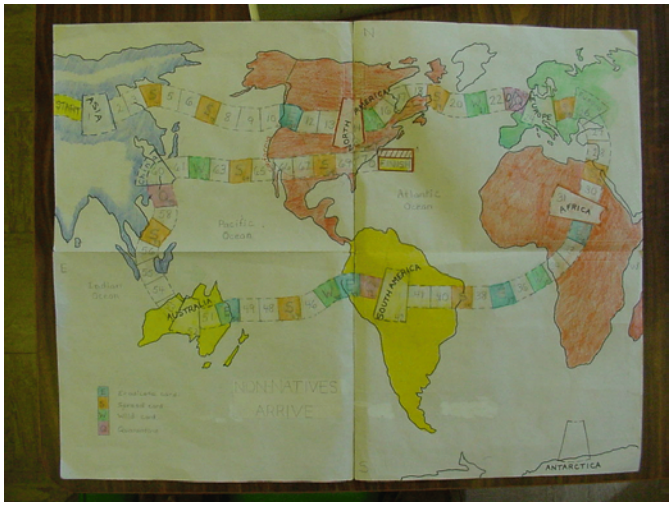
Ongoing assessment and Evaluation :

- Direct observation of student research presentation and poster. Were the questions answered correctly, thoroughly and thoughtfully ?
- Student responses and contributions on homework worksheet and group discussion on trade.
- Student responses and participation in "Un-Wanted Invasives."
- Observations of children as they play **The Invasives Arrive Board Game.**

Modifications:

A wide range of media can be applied to this project, in addition to the posters with writing, pictures and photographs. Presentations relying on oral presentation skills, skits, poems, pantomimes, staged interviews with an expert, or video-taping are acceptable. Children can divide up roles based on their learning styles and comfort levels **(See task rotation assessment)**.

The Invasives Game



Grade levels and introduction

The game is targeted for **4th grade**, but simplifying the concepts can make it usable in **3rd grade,** which would allow it to be incorporated into the study of different countries in the NY State syllabus at this level.

A version for 2nd grade can be made by using only general concepts, such as alien, travel, trade, caring, predator, prey, plant, mammal, insect, bird, the Hudson River, ocean, continents and selected countries and states to match knowledge at this level.

The game generally runs about twenty minutes, using one dice with 2 players (game approximately 20 minutes). Using two dice with two players, the game is approximately 14 minutes. For 3-4 players, 2 dice would shorten the length of the game.

Description

Students will use a global map game board on which Spread, Eradicate,Wild Card, Quarantine and continent spaces are marked. The game can be played by 2-4 players. About 90 cards marked SPREAD, ERADICATE, and WILD influence movement and serve to introduce concepts.

Directions:

1. Cards describe situations ending in directions. Follow the directions carefully.

2. Take turns rolling the dice and move backward or forward based on the outcome. (1 dice for groups of 2, 2 dice for groups of 4)

3. If you land on the SPREAD, ERADICATE, WILD CARD or QUARANTINE spaces, follow the directions carefully. Cards describe situations ending in directions.

Spread cards describe situations where non-natives are spreading and sometimes become a problem.

Eradicate cards describe ways to prevent (stop from entering) or control (stop the spread of) the non-native species.

Wild cards can send you to another country or continent, get you into quarantine or out of quarantine, or stop the spread of any exotic plant or animal.

Examples of directions are:

Miss a turn.
Go back____spaces.
Go back or forward to _____(continent or country).
Go to Quarantine. (The nearest one backward or forward. Skip a turn)
Go forward _____spaces for_____.(e.g. catching a possible exotic entering the U.S.)
Stop the Spread of...
Get out of Quarantine (No need to move to quarantine space.

Community Mess Cards coming soon:

Chance Cards:

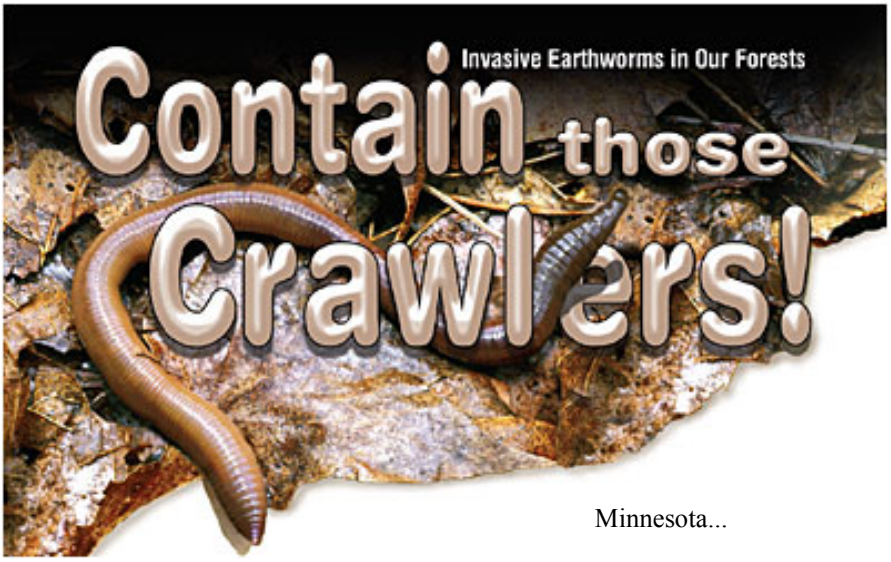
Go to Africa, if you pass , collect .
Go directly to Quarantine
Get out of Quarantine Free
Advance token to nearest seaport, pay inspectors a $ 50 fine for emptying your ships ballast water at the dock.
Skip a Turn. You;ve brought in a beetle on untreated wood.

APPENDIX: Invasive species ideas (Groups of 3-4 students, pick one of these species to research in class). These packets were provided for a research project in 4th Grade:

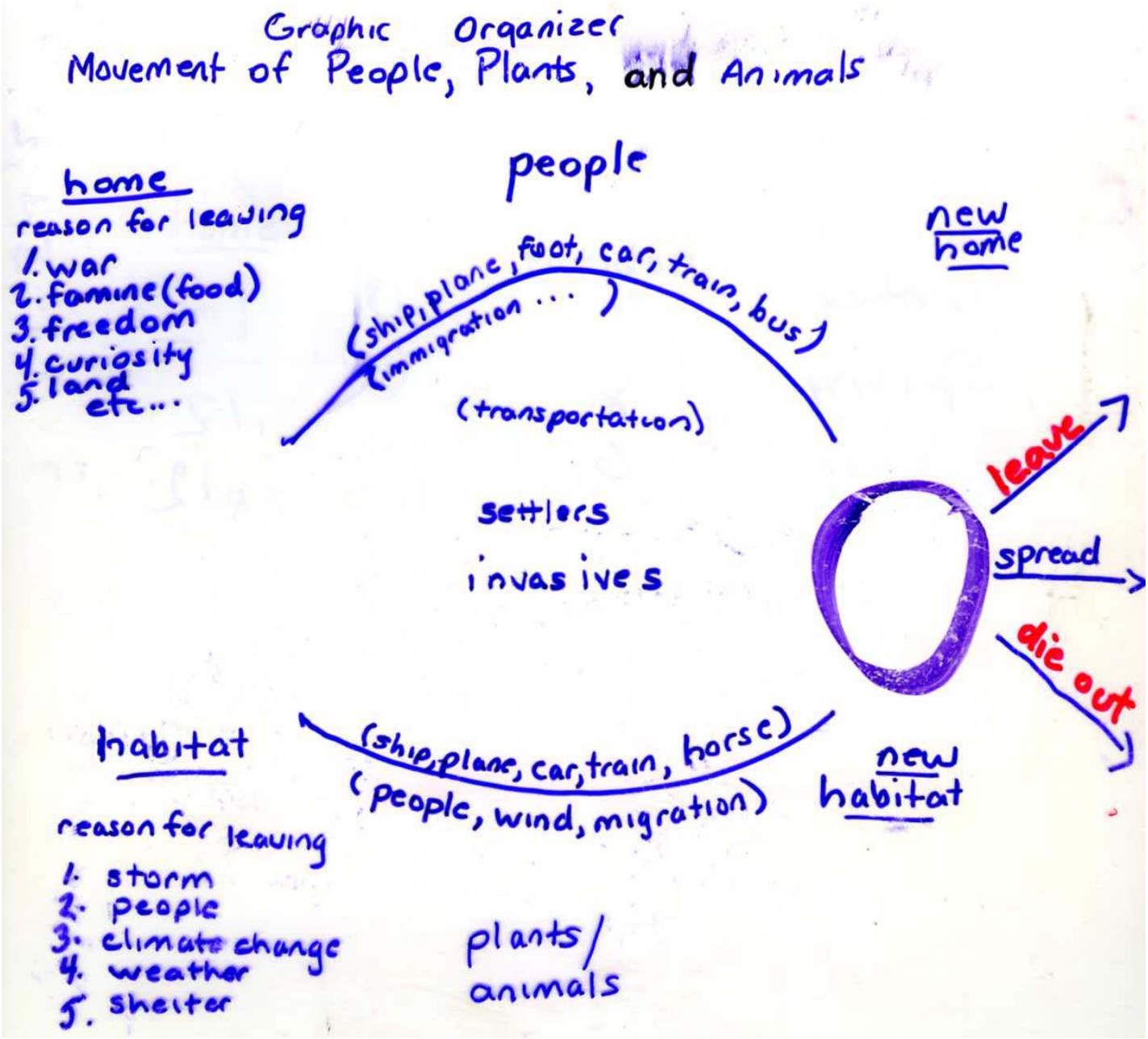
Earthworms
Gypsy moths
Purple loosestrife
Halloween ladybug
Barberry
Asian Long-horned Beetle
Zebra mussels
Italian Wall Lizard
Northern Snakehead Fish
Starlings
Giant Hogweed
Japanese Beetle
Cats
Norway Rat
Nutria/Muskrats in Europe
Hemlock Wooly Adelgid
Chinese Water Chestnut

Chestnut blight
Emerald Ash Borer
Sudden Oak Death

Or any other introduced species of interest to the class.



Minnesota...



Graphic Organizer tying together Social Studies and Science (Invasive Species) concepts.

Pitcairn News 7/21/2000

The cats and rats of Pitcairn

ANGWIN (Napa County) Calif.------ It's cats or rats for Pitcairn Island, the tiny South Pacific isle made famous by the "Mutiny on the Bounty."

Rats are literally eating the 50 or so people on the remote little island poor, and the only way to stop the pests, it seems, is to grow a new crop of cats.

The trouble started last year when the island government engaged a rat extermination outfit to rid Pitcairn of its rats. Previously the rats had been held at bay by a considerable number of cats on the one-by-two mile island, located about midway between Panama and New Zealand.

"We're going to get rid of the rats, and you'll have to get rid of your cats," the exterminators told the Pitcairners. "Once the rats are gone your cats will start picking off your birds, and you certainly don't want that."

So Pitcairn's cats disappeared.

The rat exterminators did their work of ridding the island of the rats, or at least seemed to at the time. But only a short time after they left Pitcairn the rats reappeared. In huge numbers!

The islanders have taken to picking the varmints off with their .22 rifles. In just a few days, for example, Tom Christian, the island's radio officer, accounted for 200 of the critters, and another islander bagged a similar number.

But it was easy to see that mere guns wouldn't win the war. So three tons of rat bait has been imported. But it is not all that effective in wet weather, which happens almost every week on Pitcairn. Traps by the score have been set. But still the rats appear to multiply.

"Some people are finding as they set traps and carry on up the hill, on the way back they have to empty and reset them," says Pitcairn Miscellaneous

newspaper.

"At certain times of the day any travelers on the roads will count in tens the number of rats scurrying to safety." The rats are eating corn before it mature oranges, bananas, almost everything the islanders grow.

In the face of what has been a largely losing battle, the Pitcairners are now turning to the only force that has kept the rats at bay in the past. Cats!

"A pair of cats was recently brought to the island, and now there are seven kittens in that family," says Christian. "We're applauding every new cat that comes to Pitcairn."

He says the cats are being fed pills that will counteract any poison they migl ingest from rats they catch which might have just been poisoned.

The bait will be used, the traps set, and the blizzard of bullets will continue, but it is in their cats that the Pitcairners see victory over their plague of Paci rats.

###

Name_____ Date_____

Invasive Species Research Project

Name of Non-native (invasive) species:_____

1. What does the species look like ? Describe it so your fellow classmates could find it (Provide a sketch, photocopy or photograph, or try a detailed description).

2. Where did the species come from ?
Relative location (region or area:_____,
country:_____, and continent:_____.
Absolute location (latitude/longitude)_____

3. How did the species arrive in the US ?

4. How does it spread? How fast ?

5. Where is it in the United States now? (Describe or draw a map.)

6 . What bad things or problems (negative impacts) does the invasive cause in our neighborhoods/our state ? Hint: What does the species do ? Example: Multiflora rose has sharp thorns which hurt us. Spreads fast into fields and forests. What does it do to native plants ?

Any good things ?

7. Any ideas on how it could have been stopped before it got started in America ? Any ideas on how it can be stopped now ?

Name_____ Date_____

Where's That From ?

Define the following definitions:
(Please remember to answer in complete sentences.)

Trade:

Transportation:

Find two items in your household and check to see where they are from. (examples: clothes, food, electronic equipment, toys...)

1. Name the two items. Describe them.

2. What State or country is each object from ?.

3. Continent (s) of origin.

Extra challenge: Can you describe the climate of the country or continent ?.

Un-Wanted Invasive Species
What Are They ? - Study Guide

Name_____ Date_____

Answer the following questions using the Non-native Species: Exotics, Invaders and Pests brochure.

Fill in the blanks:

1. _____ out of every 3 plants in New York State are from another country.

2. By the year 2003, controlling zebra mussels cost more than _____.

3. List **6 ways** non-native (invader) plants and animals can hide and enter the United States. _____
,_____,_____,_____
_____,_____,_____
_____.

Circle the most appropriate answer:

4. Why have animals from other countries been brought (introduced) into the United States ?

a. food
b. medicine
c. landscaping
d. by accident
e. all of the above

(Please, turn over)

Fill in the blanks:

5. Barberry bushes came from_____.
   The Halloween ladybug is from_____.
   Starlings are from_____.
   Cats came (originated) from _____.

Europe/Japan
Japan
England
North Africa

Answer either True (T) or False (F)

6. How can you stop invading plants and animals ?

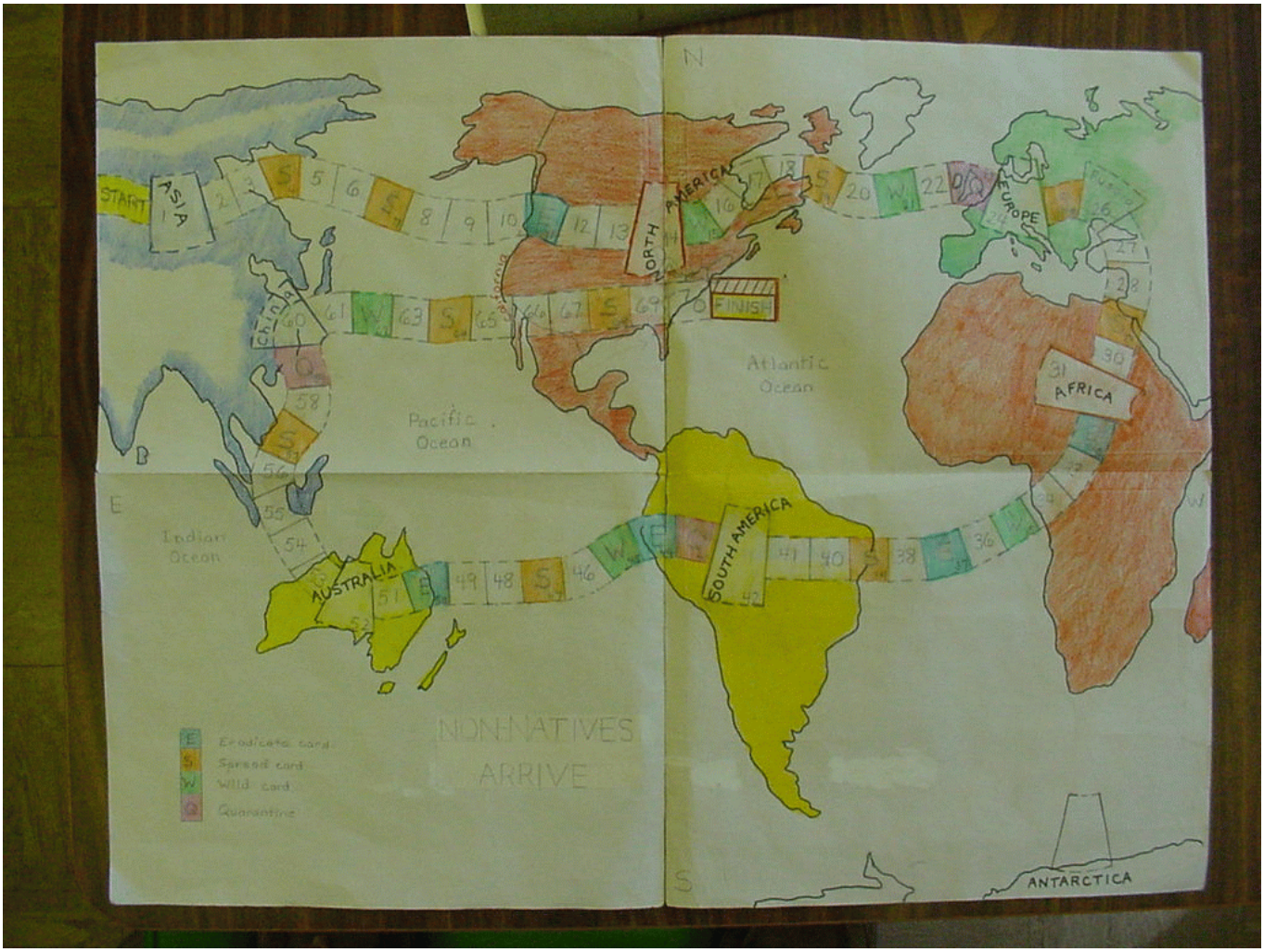
_____ Plants and seeds from other countries make wonderful gifts for friends in New York.

_____ Don't plant invasive landscape plants like Barberry and Purple Loosestrife.

_____Invading plants and animals usually have many predators.

Word List

species
exotic
introduced
alien
pest
native
non-native
spread
wild
valley
control
impact
movement
location
travel
trade
continent
country
transportation
predator
immigrants
invasive
research
quarantine
eradicate
ballast
export
import



The Invasives Arrive Game

GRAPH READING

Problem solving:
A. Using Data From a Bar Graph.

1. The bar graph shows that Texas has _____ introduced plants and _____ native plants.

2. Which state on the graph has the greatest number of different plants ?

_____

3. Which state has the smallest number of introduced plants ?

_____

4. Which 4 states have the greatest number of introduced plants ?

_____

_____

_____

_____

5. ***Strategy practice*** - Extra credit: (Or brave enough to take a guess and solve the mystery).

If New York has the largest human population (number of people), what relationship might there be between people and introduced plants ?

Hint: Are there more introduced plants in places with a lot of people ? Make up your own guess (theory) why some states have more introduced plants than others?

_____
_____
_____
_____

Hint : Compare Pennsylvania, New York and Illinois to Alaska, Colorado and Utah.

	Populations:	Year it become a state ?
New York	_____	_____
Pennsylvania	_____	_____
Illinois	_____	_____
Colorado	_____	_____
Utah	_____	_____
Alaska	_____	_____

From Graph 1, can you find what island state was the last state **and** is an exception to the rule? :_____

B. GRAPH 2.

1. Once people notice an introduced species (one that invades), costs to control it are

a) low
b)medium
c)high

DBQ Documents:

These authentic documents can be used in a Discussion-Based Question. The first five are available in PowerPoint. The remaining short essays describe current non-native species issues. The internet is full of other options. These samples provide a background which you are welcome to adapt to your needs and add to. We are not experts in the preparation of DBQs and welcome additions or suggestions.

1. Extent of alien invasions around the world (Vitousek et al. 1997). Gives the percentage of non-native plants, freshwater fish and bird in the Hudson Valley and a worldwide estimate.

2. The aliens came from all over the world. Shows where non-native species in the Hudson Valley have generally come from, including the Interior Basin, Pacific Coast, Asia, Europe and the southern and eastern United States.

3. Zebra mussels transformed the Hudson (Students can observe the changes associated with the zebra mussel invasion from plankton to oxygen to sunfish). This information courtesy of researchers at the Institute of Ecosystem Studies.

4. Aliens used several pathways to reach our area. Students can compare the number of plant, fish and invertebrate species introduced by canals, shipping, intentional, unintentional, etc. to the Hudson Valley area.

5. Aliens began to arrive a long time ago and are still coming. Shows the number of alien species arriving in 30 year intervals from 1810-1992. Students may be asked to observe that although the total number of non-native introductions is unchanged, the number of plants has decreased as animals have increased.

Graphs on invasions in the Hudson are from:

- Mills, E.L., M.D. Scheuerell, J.T. Carlton, and D.L. Strayer (1997).
- Biological invasions in the Hudson River Basin: An inventory and historical analysis. *Circular of the New York State Museum 57*: 1-51.
- Vitousek, P.M., C.M. D'Antonio, L.L. Loope, M. Rejmanek, and R. Westbrooks. 1997.
- Researchers at the Institute of Ecosystem Studies
- Introduced species: A significant component of human-induced global change. *New Zealand Journal of Ecology 21:*1-16.

Students can read these 5 documents and answer questions about each, drawing conclusions about the ways non-native plant and animal species are introduced and possible impacts. They then use the knowledge to analyze a question on the topic.

Teacher Resources:

-Cash, B. (1997). Notes on introduced species (Introduction to global change II - lecture notes. University of Michigan (internet)
-Simberloff, D. Impacts of introduced species in the United States (www.gcrio.org).
-The Encyclopedia of World Geography

Introduction: 10 minutes

You are a person from _____visiting the United States. At the airport you meet a Customs Agent, whose name says Immigration and Naturalization Service (INS).

She checks your passport and customs declaration; (part of a customs document is provided). Then she asks you, Have you any live plants or fruit with you, or have you been on a farm recently ? You wonder why?

The customs agent provides you with several pieces of information:

Mini-Lesson: Document Based Question

Document 1:

Earthlings vs Aliens

One of the toughest issues facing farmers, foresters and people living in urban areas is how to deal with plants which are not native to an area. Over 4,000 plants, also called exotics or aliens, now grow wild in the United States. Some are harmless, but removing the troublesome ones can cost millions of dollars. Exotic plants and animals can kill native plants and animals by changing habitat or spreading deadly diseases. These alien visitors can be found in your own garden.

1. Based on this document, explain why cultural differences are fine but people should leave plants and animals at home when they visit faraway places.

Document 2

The Halloween Ladybug

This new multicolored Asian ladybug appeared in New Hampshire in 1993. The first U.S. discovery was in New Orleans in 1988. The non-native ladybug was intentionally released in the United States and Canada about 1970 because of its value in eating aphids and other insects. None of the intentional releases were successful. No survivors were found after a few months.

1. How long did it take for the Halloween ladybug to spread from the southern United States to New Hampshire ?

Document 3.

WANTED: Destroying Maple and Other Hardwood Trees:

The Asian long-horned beetle is a newly introduced non-native to the U.S. It has been found in several locations in New York City and Long Island, and is believed to have started at Kennedy Airport. It attacks and kills many trees, including maples, elms, willows, poplars, ashes and birches. Thousands of trees have been destroyed in New York City to stop this pest. The beetle probably came from China in wood packing material. It has been found in warehouses in several other states. It is hard to stop because so many things we buy are made in China.

1. Based on the document, what would be the best places for an inspector to search for these beetles ?
Hint: Consider how products are transported in trade.

Document 4:

The American Chestnut Story

In 1904, a non-native fungus, probably imported from China on plants before quarantine laws started spreading throughout the United States. Since then, the fungus has spread up to 50 miles per year. By 1950, the American Chestnut tree, all but disappeared. It was once one of the most common trees in American forests.

Graph 25 %

0%

1904 1950

According to the passage and graph, what effect can a species of fungus brought into a country by accident have on the native habitat ?

Document Based Question: Part B-Essay

Using the documents, the answers to the questions in Part A, and your knowledge of social studies, write a well organized essay.

Background:

New plants and animals brought into a country can cause unexpected changes.

Task:

- Explain what you think could happen if the Asian long-horned beetle spread throughout the United States.
- Include an introduction, body and conclusion
- Use information and details from the documents in your answer

- Include examples and reasons in developing your ideas.

Extensions:

Visit from a person in the INS or APHIS (Animal and Plant Health Inspection Service).
What is currency ? Do you need to exchange any money ? Cultural symbols and historic figures on currency.
What is the name of the money used.
Math: Exchange rates and conversions.
Where do Things come from (Lesson on trade and the origins of articles: Shirts, shoes, and Watches (& Candy)
 by Jim Krachi (attached)

Field trip: Invasives: Ideas

1. Introduction: Invasives: (5-10 minutes depending on audience)

What are they ?
What is an invasive species?
-Pests, exotics, invaders, introduced species...
-Harms human health, native plants and animals and costs money.
-May be beneficial too (barberry, ladybugs, loosestrife beetles.)
Can be native (poison ivy and habitat change)

2. How do they get here ? (10 min) Trade, travel, recreation (ticks), climate change...
Main invader paths - Hudson River, Great Lakes, ports, airports (ships, trains, cars, trucks, planes, railroads)

- Trade - samples of products (jam-Poland-zebra mussels, toy/wood-China-pallets- Asian Long-horned Beetle- Asian ladybug, banana-Honduras/Columbia, T-shirt-Brazil...)

- 4,000 exotic plants (2,300 exotic animals). 1 of 3 plants in NY is not native.

- Of 100 - 10 will spread - five will move to nature- 2 to 3 will spread and become pests.

- How might they be stopped.
- Ballast water - zebra mussels - ozone
- What is APHIS (Animal, Plant Health Inspection Service)

3. Search for introduced species in the area(15 min)

- Discuss
- Concept of trade with countries/regions of similar climates being most likely to spread invasives. China-Russia-North America-Japan vs Antarctica/tropical Africa/Asia/South America)
- Where might we be going ?

4. Box of species samples and related artifacts for children to guess at. (10 min)

- Discussion about worms... Where they came from. Impacts of glaciers. Spread. What they can do to soil - beneficial or not ?

5. Conclusion: Jeopardy-like game. (20 min)

Points (each): 5, Wild Card: 10

Categories: TRADE TRANSPORTATION PLANTS ANIMALS WILD CARDS

5 cards each column
Children break up into 5 groups and cooperate with each other, and collectively decide on answers. Team with highest points wins. Many variations possible.

The Italian Snail

When you get home from a trip to Europe,
a snail from Italy has caught a ride in your suitcase

What will you do?

1. Put it on a bush outside
2. Send it back to Europe
3. Throw it in the garbage
4. Put it in the fishtank.

You decide to put it in a fish tank with your hermit crabs.
It escapes.
What now ?

1. Don't worry about it.
2. Call APHIS (Animal and Plant Health Inspection Service) for advice. On the web at aphis.usda.gov.
3. Learn more about it. Can it survive in below freezing weather? What does it eat?
4. You search for it.
5. If the habitat is all wrong for it, you don't bother. ?

Next Summer:

Snails that look a lot like your hitchhiker from Italy have eaten most of your mom's garden.
Which of these statements are false ?

1. The animals are able to survive freezing temperatures.
2. Sorry, you will be famous for starting yet another exotic species.
3. You should finally call APHIS or a Cooperative Extension Agent.
4. The animals new habitat is not much different from where it came from so it is doing well. It likes it here.
5. The snail appears to have no natural predators here.
6. Nothing can stop them from spreading.
7. All of the above.

10 years later

1. There is a quarantine on all plants in your county. Your local plant nursery and several farms have closed.
2. A snail eradication program is being conducted by APHIS, costing taxpayers $200,000.
3. The new snails were found on lettuce in New Jersey and in a garden near Newark.
4. The snail has been identified as a major threat to many commercial crop plants and

reproduces much more quickly than native snails.
5. Local researchers have discovered a possible connection between this new snail and the decline of a locally rare land snail.
6. People wonder how this nuisance got started.

Questions:

How do snails reproduce ?
What do they eat ?
How can they be controlled ?
How could the problem have been avoided ?
How are they beneficial ?
What is their habitat ?
Where do they get their shells?

How would the immigration of people or the spread of non-native plants or animals cause animals or plants to become endangered ?

What happened to many Indians when European settlers came?

What does this painting, "The First Thanksgiving" by Jennie Brownscombe tell us about native and invasive plants, animals and people ?