

# Native or Not

Everyone knows that we don't have tigers, elephants and ostriches in North America (except in zoos or wild animal parks). Many people don't realize that there are less-obvious, but equally exotic, animals in our midst. Scores of plant species from other continents have also become established here, with the aid of humans. Some of these non-native, or introduced, species have been here for hundreds of years and are so common and widespread that many people aren't aware that they are not native to this continent.

## Background

Plants, animals and other organisms have geographic ranges, or distributions, where they occur naturally. Some organisms have very restricted ranges. For example, the Virginia pigtoe, a freshwater mussel, is found only in Virginia, and several species of freshwater fishes (the Roanoke logperch, the Carolina darter and the whitemouth shiner) only occur in a few river drainages in Virginia and North Carolina. Other organisms have very wide distributions. For example, the distributional range of the raccoon includes southern Canada, the entire United States, Mexico and most of Central America.

During the colonial era, Europeans deliberately introduced plants to North America for food and medicine (dandelion and chicory) as well as ornamental purposes (tree-of-heaven). Other plants such as kudzu, Japanese honeysuckle and multiflora rose were introduced much later for erosion control and now occur over wide areas of North America.

Non-native animals have also been introduced. The house mouse, Norway rat and black rat all came to North America on the ships of early European

colonists. Intentional releases as recently as the mid-1900s include the nutria, a South American rodent brought to North America by the fur industry, and the sika deer, released as a game species. Intentional releases of birds include the house sparrow, European starling and rock dove, all of which have become well-established and are now widely distributed. Others, such as the crested myna and the Eurasian tree sparrow, occur in only a few places.

Plants, animals and other organisms coexist in assemblages called communities. Members of a community are an ecologically and evolutionarily diverse set of organisms that live close enough together to interact. Each organism has a unique functional role, or ecological niche, in the community. The ecological niche for an organism depends on where it lives, how it is constrained by other species and what it does in the community (how it behaves, how it responds to and modifies its environment, and how it transforms energy). Because each species' niche is unique, one species can never completely replace another in a community.

A major component of each species' ecological niche is the transfer of energy through a food chain. Plants are the first link in a food chain.

Plants are energy producers because they can convert nutrients and water into chemical energy in the presence of sunlight. Animals that eat plants are called primary consumers; animals that eat primary consumers are called secondary consumers; and animals that eat secondary consumers are called tertiary consumers. In the illustration at the end of this activity, the woodchuck is a primary consumer. The fox that eats the woodchuck is a

## Grade Levels: 4-10

### Objectives

Students will investigate native and exotic species by:

- researching the ranges of selected species
- identifying selected species and the habitats where they are found
- counting individual organisms and colonies
- describing the location and spacing of plants
- estimating the area affected by exotic species

### Materials

- appropriate clothing for the season and weather conditions
- Virginia invasive plant species list
- field guides
- invasive non-native invasive species factsheets
- Virginia Native Plant Finder
- Virginia Invasive Species Finder
- student worksheets
- string or yarn

### When

Spring through fall.

### Where

Park areas with an abundance and variety of wildlife. Check with park staff for presence of invasive plants such as honeysuckle, kudzu and multiflora rose.

secondary consumer. The owl that eats the fox is a tertiary consumer.

Fungi are decomposers that convert dead producers and dead consumers back into the nutrients that plants use to produce chemical energy. Food chains can or do interconnect to comprise food webs. A food web is a complex system in which specific producers, consumers and decomposers are present in more than one food chain simultaneously.

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For example, grasshoppers and mice eat plants. Grasshoppers are eaten by insect-eating birds, frogs and snakes. Mice are eaten by hawks, owls, foxes and snakes. Insect-eating birds are eaten by snakes and hawks. The nutrients in all of these producers and consumers are returned to the system by fungi, earthworms and microbes.

In a food web, the food chains are interlocked and interwoven like a spiderweb. If only a small part of the food web is modified or removed, little changes in the food web as a whole. But if a major part of the food web is modified or removed, the entire system may be altered. For example, if one or more predators are removed from the food web, prey populations often increase dramatically until some other factor (such as disease) causes a reduction in the number of prey animals. If there are no consumers to eat a particular plant species, then those plants will grow unchecked.

Plant and animal species compete for resources such as space, sunlight, food, water and nesting sites. Ecological competition is the interaction between two or more organisms that are striving for the same resource (food, water, space, sunlight) at the same place and time. If the organisms belong to different species, competition may result in one species forcing another species to eat a different food or to move elsewhere to survive.

For example, European starlings were introduced into New York City in the late 1800s. Today, this species is widely distributed across North America. Starlings nest in tree cavities near open fields and woodland edges, exactly the places that Eastern bluebirds nest. European starlings aggressively displace Eastern bluebirds from these nest sites, destroying their eggs and killing their nestlings.

Introduced species can disrupt food webs. Invasive species are the second largest threat (behind only habitat loss) to the existence of native organisms. In 2000, the cost to the United States economy in environmental damage and losses from

invasive species was estimated at \$125 billion. Moreover, nearly half the plants and animals listed as threatened or endangered are vulnerable to competition or predation by introduced species.

Once a non-native species is established, it may get “out of control” and spread quickly and widely (invasive), disrupting the ecological balance present in native communities. The natural controls that keep a species in check in its native community include predators, disease, parasites and ecological competitors. Some or all of these controls may be absent when a non-native species is introduced to a new environment.

Invasive insects include the hemlock woolly adelgid and the gypsy moth. The adelgid was introduced accidentally from China or Japan in the 1920s. In the 1860s, gypsy moths were brought to the United States in an effort to establish a commercial silk industry in this country. Both of these insects defoliate trees: the hemlock woolly adelgid feeds on eastern hemlock, and gypsy moths feed on oaks.

Neither insect has natural predators in eastern North America, so both are now widely distributed and have caused widespread damage to the forests they inhabit.

### Procedure

#### Before the Trip:

Using the Virginia Invasive (non-native) Plant Finder (<http://www.dcr.virginia.gov/natural-heritage/ip>).

1. Have students generate a list of possible non-native plant species at the park by selecting the region mountain, piedmont or coastal plain in which the park lies. The regions generally have different soils, elevation, hydrology and climate, so the plants in each are generally different. For specific information about regions, visit the Virginia Natural Community overview (<http://www.dcr.virginia.gov/natural-heritage/>

### Additional Activities

Use resources listed below to investigate methods for eradicating, managing, and controlling introduced plants and animals. For example:

- several research groups are studying beetles that prey specifically on hemlock woolly adelgids
- chemical insecticides can be used as control measures for hemlocks in urban settings
- gypsy moths are controlled by a chemical pheromone that disrupts the mating cycle of gypsy moths
- areas that are lightly infested with multiflora rose can be cleared with shovels or hoes, but the entire root system must be removed
- heavy infestations of these roses must be treated with repeated mowing, herbicides or both

### Resources

#### Websites

- <http://www.dcr.virginia.gov/natural-heritage/document/nh-invasive-plant-list-2014.pdf>
- <http://www.dcr.virginia.gov/natural-heritage/invspfactsheets>
- <http://www.dcr.virginia.gov/natural-heritage/np>
- <http://www.dcr.virginia.gov/natural-heritage/ip>
- <http://www.dcr.virginia.gov/natural-heritage/document/mnginv.pdf>

Civilian Conservation Corps Alumni: [www.cccalumni.org](http://www.cccalumni.org)

The Center for Research Libraries. Allows a search through CRL's Civilian Conservation Corps' Camp Papers database.

Contact your school or local public library to request resources through interlibrary loan [www.crl.edu](http://www.crl.edu).

“Memories of Virginia Civilian Conservation Corps Camps” booklet available at the CCC Museum, Pocahontas State Park.

New Deal Network: Read President Roosevelt's greeting and congratulations to the Civilian Conservation Corps from 1933.

The History of Virginia's State Parks: <http://www.onlyinyourstate.com/virginia/great-depression-va/>

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- natural-communities/ncoverview).
2. Have students also generate a list of possible native plant species at the park using the native plant finder tool (<http://www.dcr.virginia.gov/natural-heritage/np>).
  3. Lead a class discussion on ways that species have been introduced to North America. Include some discussion about how control measures are used to manage introduced species and discuss successful recovery measures (e.g., bluebird boxes).

### At the Park:

1. After consulting with park staff, provide factsheets for the non-native invasive species known to occur at the park.
2. Identify appropriate areas in the park, divide students into teams and assign each team a specific area to investigate.
3. Using the non-native invasive species factsheet, field guides and the background section of this activity, as well as information gathered through library research and the student worksheet included, have each team:
  - Identify as many non-native plant species in its area as possible.
  - Identify the habitat(s) where each species was found.
  - Determine the number of individuals or colonies located.
  - Determine spacing and location of plants.
  - Estimate the size of the area affected.
3. Have the class assemble and discuss what each team found and estimate the total area of the park affected by introduced plants and animals.
4. Discuss the impacts of the exotics on the native plants and animals.
5. To reinforce the concept of disruption of habitat by an exotic species, lead students in a discussion of the components of a food web that includes bluebirds. Students may volunteer or the teacher may

designate one or more child to represent each component of the web (“saving” some children to act as introduced species). Using strings to represent links between web components, instruct each child to use only one hand to hold appropriate string links. Add an exotic (starling) from the “reserve” of students; explain that this introduced species competes with the native species (bluebird) for nest cavities and displaces it. “Remove” the bluebird from the food web and observe the number of strings pulled, representing the links of the food web that are disrupted. Explain the “ripple effect” that follows by removing one component of the food web. For a variation, “add” an invasive predator (domestic cat), which will remove all primary consumers.

Examples of additional food chains:

- grasshopper–bluebird–hawk
- grasshopper–frog–snake–hawk
- grasshopper–white-footed mouse– owl
- meadow vole–fox–owl
- house mouse–fox
- aquatic insect–small fish–larger fish–river otter
- aquatic insect–fish–bald eagle

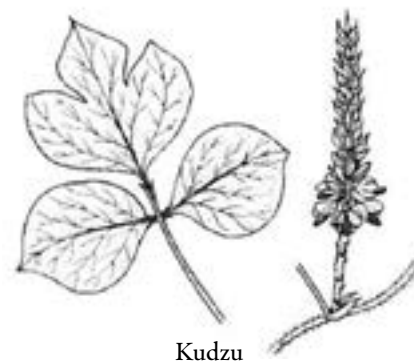
### Follow-up:

1. Lead a discussion that might address some or all of these questions:
  - *What would happen (short-term) to mouse and rabbit populations (prey) if all the foxes (predators) suddenly died of a disease? What would eventually happen (long-term) to the mice and rabbits? Why?*
2. Why do you suppose there are so many white-tailed deer in Virginia?
  - Since large predators such as gray wolves and mountain lions have been removed from much of eastern North America, *how do you think the populations of medium-sized predators such*

*as raccoons and foxes have been affected? What do you think was the immediate effect on prey such as mice and rabbits, which are small primary consumers? How might that have affected the plants they feed on?*

### Other Activities

- Have students use field guides and information gathered through library research to identify native and non-native species.
- Volunteer Opportunity - Contact the park manager or natural area steward to see if there is an opportunity to help with the management of non-native species at the park or natural area preserve.



Kudzu



Japanese Honeysuckle

## Native or Not

 Short-horned Grasshopper	Habitat	Number of individuals or colonies	Behaviors observed (for animals)	Spacing and location of plants	Estimated size of the area affected	Other
Native species						
1.						
2.						
3.						
4.						
5.						
Exoctic species						
6.						
7.						
8.						
9.						
10.						



Female House Sparrow



Male House Sparrow

# Native or Not

Non-native birds, mammals and plants found in North America, Virginia or both.

## Mammals

- House mouse
- Norway rat
- Black rat
- Black-tailed jackrabbit
- Sika deer
- Nutria
- Wild pig

## Birds

- European starling
- House sparrow
- Rock dove

## Plants

- Kudzu
- Purple loosestrife
- Japanese honeysuckle
- Multiflora rose
- Dandelion
- Chicory

