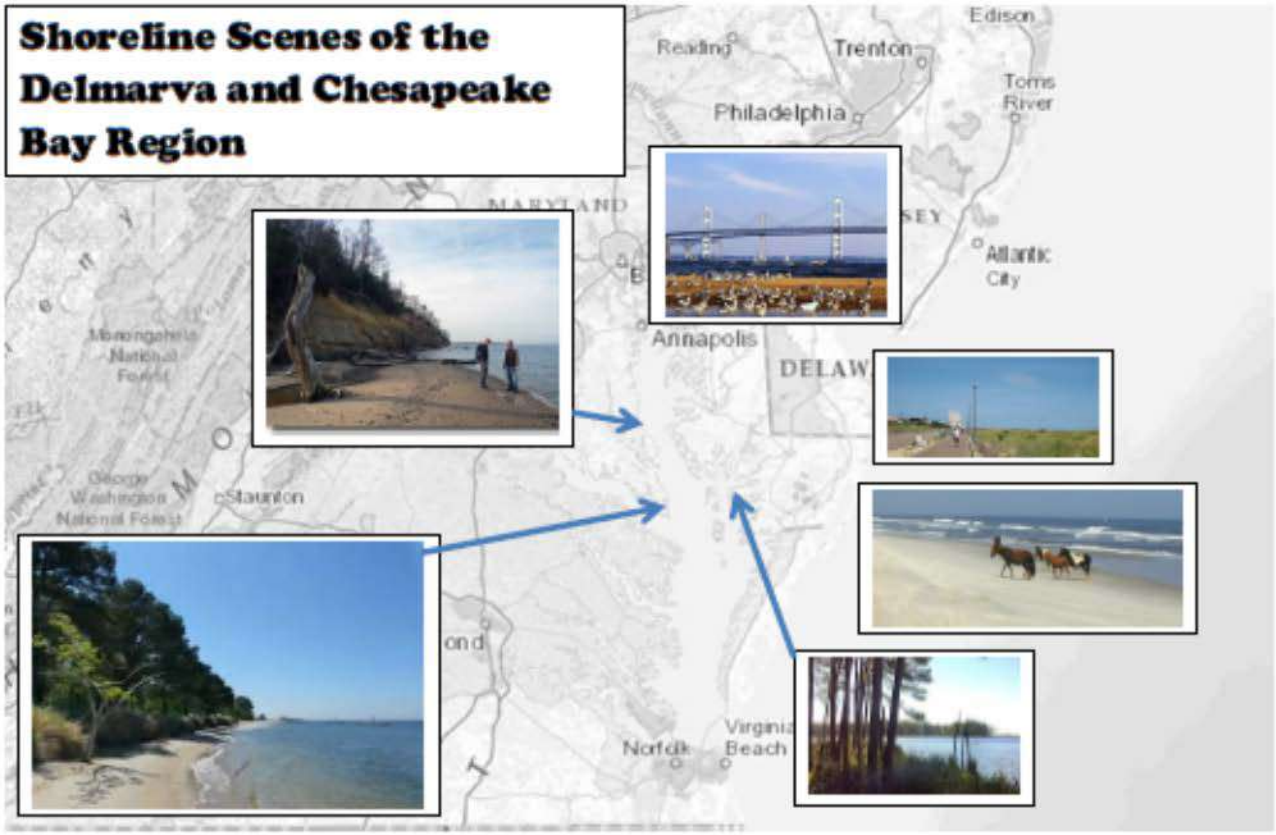
ECOSYSTEMS IN DELAWARE

Student Activities and Readings


Harrisburg
Reading
Philadelphia
Trenton
Edison
Toms River
Atlantic City
Dover
Baltimore
Annapolis
Washington
Hagerstown
Monongahela
Monongahela National Forest
George Washington National Forest
Harrisonburg
Staunton
Lynchburg
Roanoke
Richmond
Norfolk
Virginia Beach
MARYLAND
DELAWARE
NEW JERSEY
VIRGINIA
MOUNTAINS

DRC Geography Ecosystems in Delaware and the Chesapeake Bay Watershed for grade 5 Student Handout 2



Left to right: 1) Trees grow close to the edge of the Chesapeake Bay at Pt. Lookout, MD 2) Erosion exposes fossils and undermines the forest at Calvert's Cliffs on the western shore of the Chesapeake 3) The Chesapeake Bay Bridge spans the narrowest point of the Bay from Kent Island to Sandy Point, MD 4) On Delaware's Atlantic Coast, the boardwalk at Rehoboth Beach, DE is protected by barrier dunes. 5) Wild ponies walk the beach at Assateague Island, Virginia on the Atlantic coast 6) Salt marsh and quiet inlets meet the eastern shore of Chesapeake Bay at Blackwater Wildlife Refuge near Easton, MD.

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Assateague Island National Seashore Park

Assateague Island, Virginia, is a narrow barrier island along the Atlantic coast of the Delmarva Peninsula. On the eastern side of the island, beach erosion is a constant problem, and coastal storms can sometimes cause major damage. The National Seashore Park on Assateague tries balance the need to protect this natural area with the desire for recreation. Each year thousands of summer visitors come for fun in the sun.

The park is famous for its Wild Chincoteague ponies. The ponies sometimes join sunbathers and fishermen on the beach and in parking lots. They can cause traffic jams and distracted drivers. But most often they prefer to roam the wetland areas, forests and meadows of the island's interior.

Blackwater National Wildlife Refuge on Maryland's Eastern Shore is about 12 miles south of the town of Cambridge. It opened in 1933 as a refuge for migratory birds. The water levels and salinity levels (salt level in the water) in the rich tidal marsh change often. The refuge includes freshwater ponds, mixed evergreen and deciduous forests, and small amounts of cropland. Each physical habitat supports different birds and animal life.

Canadian Geese often spend the winter here. The Atlantic Flyway is an important bird migration "highway" along the East Coast of the United States. From October through November, as many as 50,000 geese, ducks, and tundra swans take a rest stop at Blackwater Refuge. Up to 20 species of ducks and 250 species of other birds may also be seen here, along with several hundred species of plants, 35 species of reptiles and amphibians, and numerous mammals. White-tailed deer and the sika deer (an Asian species) are hunted at certain seasons.

The endangered Delmarva fox squirrel, the migrant peregrine falcon, and the American bald eagle are protected from hunting and trapping.

Calvert Cliffs State Park is located on the western shore of the Chesapeake Bay. Cliffs dominate the shoreline of the Chesapeake Bay for roughly 24 miles in Calvert County. The cliffs were formed 10 to 20 million years ago when all of Southern Maryland was covered by a shallow sea. When the sea receded, the cliffs were exposed and began eroding. Scientists study the rock layers to learn about the natural history of the area. Fossils found in the cliffs are evidence of natural change. Tides bring high water levels twice each day. Winds and the movement of water cause erosion of the cliffs. Roots of trees and other vegetation slow the rate of erosion.

Delaware Seashore State Park is a narrow strip of sand six miles long. It is bounded on the east by the Atlantic Ocean and on the west by Rehoboth Bay and Indian River Bay. The main attractions are swimming, sunbathing, fishing and boating along the park's beaches. A special access pier at the Indian River Inlet allows the elderly and people with disabilities to get close to the fishing action. A nature trail on Burton's Island provides views of the salt marshes and bay islands. Birds like gulls and terns gather in summer nesting colonies. Thompson Island Preserve is a good example of the productive salt marsh habitat once common around the inland bays.

Cape Henlopen State Park near Lewes, DE, features ocean beaches that attract thousands of visitors every summer. Two designated swimming beaches provide lifeguard patrols between Memorial Day weekend and Labor Day. There is a modern bath house with showers, changing rooms, and a food concession. This swimming area also allows those in wheelchairs and power chairs to access the beach from the boardwalk. The Cape Henlopen shoreline provides habitat for shorebirds, horseshoe crabs, fish and shellfish.

Six Delaware Ecosystems You Should Know

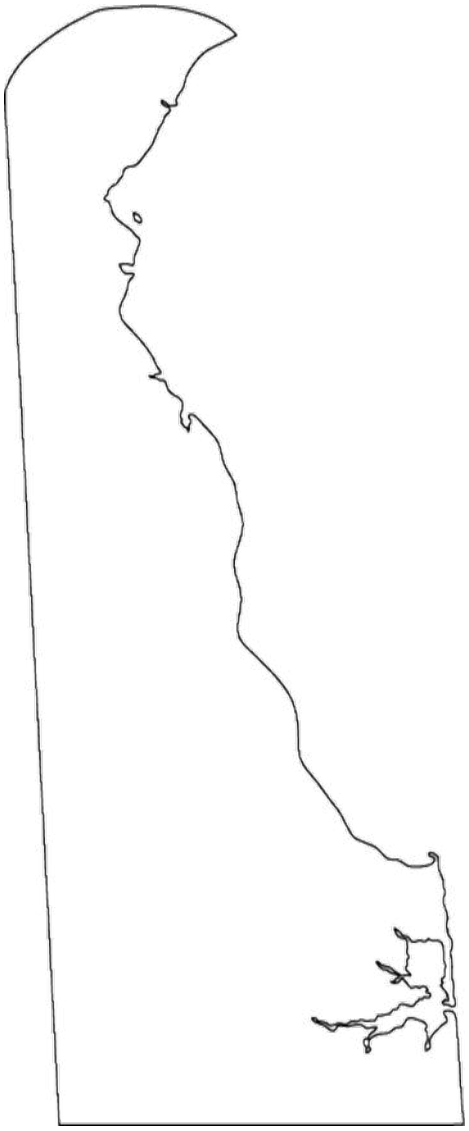
Ecosystem	Physical features	Organisms	Examples and locations
City lot Any area within a human settlement where organisms live.	Flat topography, finely graded soil, very small stones. May have streams or ponds.	Birds, ants, wasps, mosquitoes, flies, butterflies, weeds and grasses, rats, mice, pigeons, feral cats and dogs, flowers, squirrels, raccoons	Rodney Square, Wilmington 
Forest or Woodland An area covered by trees growing closely together and forming a canopy. In Delaware, a wide variety of deciduous and evergreen trees exist together. An understory of smaller plants and shrubs covers the forest floor.	Rocky, moist or sandy soils, fresh or brackish water in streams or ponds; may be flat or hilly	Birds, deer, squirrels, rabbits, beaver, foxes, skunks, grubs, reptiles, insects, deciduous trees, evergreens, vines, shrubs, fungi, lichens	Woodlands are found in all three Delaware counties. 

Tidal marsh / wetland An area where grasses and other plants and animals are adapted to continual periods of flooding from the tides and to high salt levels in the water.	Salt water, mucky soil, scattered hummocks, drainage ditches, shallow tidal streams	Muskrats, rodents, fish, waterfowl, reeds and tall grasses, cedar trees	Delaware River and Bay coastline, bordering inland bays 
Meadowland or Farmland An area used by people for agriculture. Natural vegetation has been cleared away and replanted with food plants. Plants and animals from local ecosystems must coexist with crops and livestock.	Loose soil, ridged surface from plowing, fertilizers and chemicals in soils, hedgerows and fences, may be flat or hilly	Foxes, snakes, birds, insects, groundhogs, rabbits, butterflies, moths, horses, cattle, hogs, crops, weeds and briars, small bushes, berries, trees in yards and hedgerows	Meadowland or farmland is found in all three counties of Delaware 

Cypress Swamp Under the swamp, a layer of clay prevents water from draining away. Pools of standing water are the perfect habitat for cypress trees, amphibians and snakes. Cypress swamps are common in the southeastern United States.	Clay and sandy soils, standing water, flat topography	Cypress trees, evergreen trees, fish, amphibians, water snakes, fungi, insects, Waterfowl, egrets	Great Cypress Swamp, Sussex County 
Shoreline A narrow strip of land on the ocean shore where organisms are adapted to the wave action of salt water, tidal changes in water level, and wind action.	Sand beaches, dunes, shells, clay, moving salt water, erosion from wind, wave and tidal action	Horseshoe crabs, hermit crabs, shellfish, fish, dolphins, shorebirds, foxes, cedar and pine trees, low shrubs, grasses	Cape Henlopen, Lewes, DE 

Thinking Like a Geographer

1. Which Delaware ecosystems include sandy soil? Which ecosystems include salt water?
2. Why might birds be included in every Delaware ecosystem? Which types of birds are likely to be found in each ecosystem? Why?
3. In which parts of Delaware is the tidal marsh ecosystem found? Where are forests located?
4. Use the outline map to label areas of Delaware where each ecosystem is likely to be found.



City Lot

Forest or Woodland

Tidal Marsh

Farmland or Meadowland

Cypress Swamp

Shoreline

5. What is the difference between a tidal marsh and a swamp?
6. Why might land inside a human settlement (town, city, or suburb) be free from buildings or development?

Ecosystems in the Chesapeake Bay Watershed Region

The Chesapeake Bay is the center of a large region. The Chesapeake Bay has a long shoreline and a variety of shoreline habitats. But the Chesapeake Bay Watershed includes all the areas that drain to the Chesapeake Bay.

Look carefully at the map below. The watershed is shown in white. Parts of six states and the District of Columbia make up this region. Can you name the states?

NATIONAL GEOGRAPHIC education

Ecosystems Far from the Bay

Places inland from the shoreline of the Chesapeake Bay have different physical conditions and produce habitats that are very different from those we read about at Blackwater Wildlife Refuge and Calvert Cliffs. Differences in soils, climate, and topography impact ecosystems in important ways. Plants grow best in soils that contain the nutrients they need and in places where they get the right amount of water. Animals thrive where they can find foods they need and where they can find shelter. Living things can adapt to small variations in their habitat, but when the changes are too great, they die.

Directions: Read about four parks in the Chesapeake Bay Watershed Region. Examine the pictures and locate each park on the watershed map.

Melondy Hill State Forest - New York State

The Melondy Hill State forests got their name from people who settled these foot hills of the Catskill Mountains in New York. In the early 1800's much of the land was cleared for agriculture. But the long harsh winters made farming here difficult. People began to leave the area looking for better conditions.

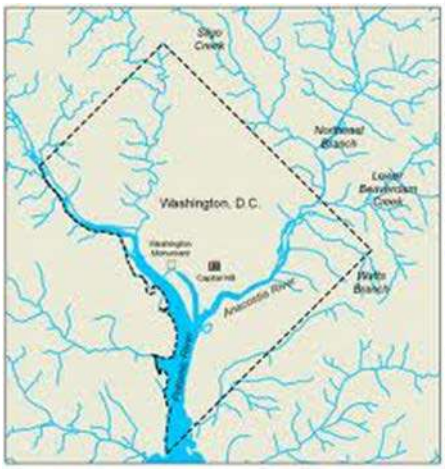
Now many acres are being restored to forest. The planted forests include many types of trees including red pine, white pine, Scotch pine and Norway spruce, and natural forest stands consisting mostly of red maple, American beech, sugar maple, red oak, black cherry, white ash, white pine and eastern hemlock. Here small mountain brooks begin the long journey to the Chesapeake Bay. There are hills to climb, rock outcrops to explore, and varied wetlands to see. The varied habitats sustain populations of turkey, deer, squirrels grouse, numerous song birds, vertebrates and invertebrates. Even a few bears have inhabited the area's forests in recent years.

Great Falls of the Potomac Park Virginia

The Potomac River and unique geological features have shaped the land at Great Falls for thousands of years. Here the waters of the Potomac River tumble over rapids and swirl around small, rocky islands. Floods regularly occur along this stretch of the river. Flood waters carry away soils and plants from the river banks and deposit new silt and seeds to take their place.

This is a dynamic, always changing environment. It is home to rare plant communities and a variety of wildlife. Most of the park's 800 acres are forested. Throughout the year, over 150 different species of birds can be seen at Great Falls Park. Native animals, such as whitetail deer, fox, box turtles, squirrels, coyotes, bats, and chipmunks also call this place home. A wide variety of plants, including several rare species, thrives in this environment. Because the park is so close to metropolitan Washington, D.C., thousands of visitors come to this park each year.

Anacostia River Park in Washington, D.C.



The song of a meadowlark joins the sounds of friends, families, and fun as tourists flock to Washington, D.C. Almost a hundred years ago this multiple use park was established along the Anacostia River that threads its way through our national capital. Seventy years ago city planners decided to use the floodplain near the river to do two things at once: Anacostia Park serves as a playground while protecting the natural scenery and water quality of the Anacostia River.

But protecting the Anacostia from pollution has been very challenging. Urban run-off (water from streets and buildings) is one of the big threats to the Chesapeake Bay. The grass and trees of Anacostia Park filter urban run-off before it reaches the Potomac River, one of the major tributaries of the Chesapeake Bay.

Left: Students volunteer to clean up the banks of the Anacostia River.

Shenandoah National Park in Virginia includes 300 square miles of the Blue Ridge Mountains in the southern Appalachians. The park rises above the Virginia Piedmont to its east and the Shenandoah Valley to its west. Two peaks, Stony Man and Hawksbill, exceed 4,000 feet.

Tens of thousands of living creatures make their homes in the park, from black bear resting beneath rock overhangs, to tiny aquatic insects darting through cool mountain streams. The park's many worlds are fascinating to explore. Before the park was established, small farmers struggled to make a living in mountain clearings. Lumbering was a major industry. Today hardwood forests again cover the slopes.

Most of Shenandoah's landscape is forested. In the process of photosynthesis, converting light, water, and minerals into foods, green plants give off water. From a distance this air-born water creates a faint haze giving the Blue Ridge its name. In recent years, the haze has taken on other ingredients, introduced by humans. Air is among the resources the staff at Shenandoah National Park is duty bound to protect. A scenic highway called Skyline Drive attracts tourists to enjoy the scenic beauty.

Thinking like a Geographer

Comparing Climate: Use the chart below to answer questions about climate and how it affects ecosystems.

Park	Average Rainfall in inches	Average Snowfall in inches	Days of Precipitation	Average High Temp (F)	Average Low Temp (F)
Melondy Hill State Forest, New York State	39.6 in.	70.5 in	146	80.6	12.3
Great Falls of the Potomac, Virginia	23	21	112	86	26
Shenandoah National Park, Virginia	27.5	25	130	79.5	16.8
Anacostia River Park, Washington, D.C.	24	15.6	114	88.5	28.7
U.S. Average	36.5	25	100	86.5	20.5

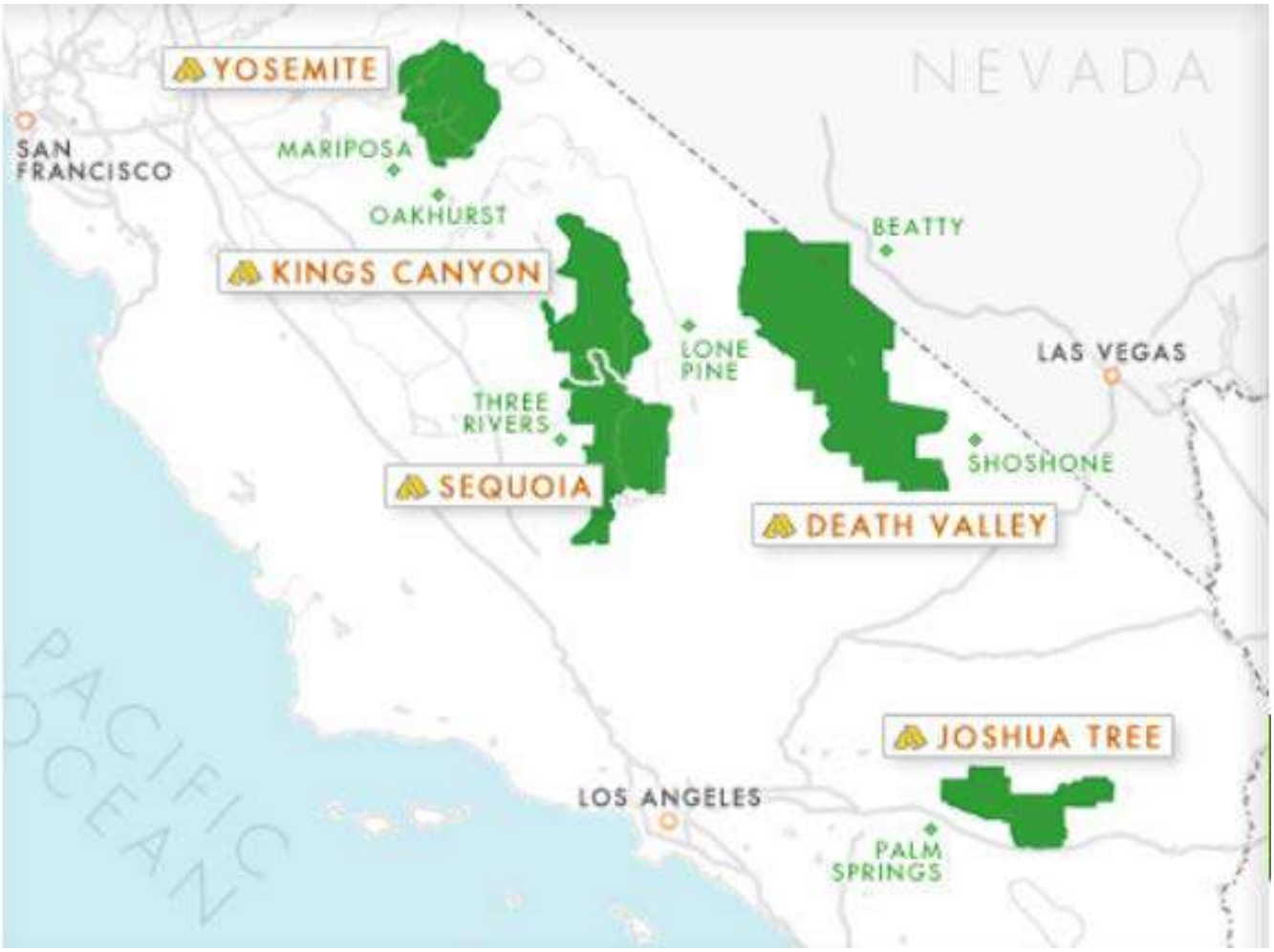
1. Which park reports the most average snowfall? How might long, snowy winters affect ecosystems?

2. Which park reports the highest average temperatures in summer? What are some ways that animals adapt to high temperatures?

3. Select one park. Use the text and the chart above to explain how the living things in that ecosystem are affected by the climate conditions of their habitat.

Check for Understanding - Lesson 1

California is a large state with 25 national parks. Each has different ecosystems. This map below shows the location of several national parks. Focus on Yosemite and Death Valley.



Use the data in the charts below to compare these two national parks.

- How are the ecosystems in these two national parks different?
- Give two reasons why the ecosystems in these parks might be different.

LOCATION and DATA	Ecosystem Differences	Reasons for Differences
Climate Data for Death Valley / **Yearly Amount** Record High Temperature F° — 134 Average High Temperature F° — 91.4 Average Low Temperature F° — 62.9 Record Low Temperature F° — 15 Precipitation (inches) — 2.36		1. 2.
Climate Data for Yosemite / **Yearly Amount** Average High Temperature F° — 67.3 Average Low Temperature F° — 40.9 Precipitation (inches) — 36.07 Snowfall (inches) — 42.7		1. 2.

People and Ecosystems

Whether they realize it or not, people are part of the ecosystems where they live. As people go about daily life, they adapt to the local environment and sometimes alter it. The activities of people affect the living and the non-living things in ecosystems around them.

People remove resources from local environments

Like all living creatures, people use living and non-living resources they find around them to satisfy their wants.

Early people satisfied their desire for food by hunting, fishing and gathering plants. The diet of early people depended on what plants and animals were available at the time. On Delmarva, native people moved from place to place to find food. They spent summers along the coastline, fishing and gathering crabs, oysters and clams. During the winter, they camped in the woodlands and hunted deer and other game. The shelters of native people were constructed with saplings, grasses and vines found in the local environment. They were temporary dwellings, occupied for only part of the year. Clothing and household tools were made from animal hides, shells, stones and bones.

Beginning in the early 1600s, European settlers arrived. They began to remove resources from the local landscape on a much larger scale. New technology included iron tools, plows, carts pulled by oxen, and saw mills. These settlers began to cut down large numbers of trees to build wooden ships, buildings and wagons. Logging increased as technology improved and transportation became easier. Farm fields replaced forests, and crops like wheat, corn, vegetables, and potatoes supplied food to families. Livestock were raised to supply meat. Many acres were needed for these cows and pigs to graze. More woodland was cleared, and even swamps and marshy land was drained to allow for more fields.

On the waters bordering Delmarva, commercial fishing became more efficient. Oysters, crabs, and clams were harvested and sold. Large fish like sturgeon and shad were caught and sold in city markets. Muskrat and beaver were trapped and sold for their fur. Waterfowl hunters took aim at geese. Horseshoe crabs were gathered in large numbers to be sold to fertilizer manufacturers.

- When large numbers of animals are removed from an ecosystem, what is the likely impact?

People introduce new species of plants and animals

The European settlers brought with them the seeds they needed to grow familiar grains and other crops. They brought farm animals - pigs, sheep, goats, cows and horses, chickens and ducks - that were new to local ecosystems. They even brought trees and shrubs they liked, planting them for fruit, nuts or medicine. Some plants and animals were unknowingly brought to America on board the settlers' ships. Some of them became part of local forests and meadows and caused little harm. But sometimes plants and animals from other ecosystems grow too fast and throw the local ecosystem out of balance. When this happens, they are called **invasive species**.

Left: The nutria is a rodent that destroys stream banks

Right: The zebra mussel competes with oysters in the Chesapeake Bay.

People change topography

In the early days on Delmarva, people often traveled by boat. Most Europeans settled near the coast or on the banks of streams. As people moved inland they needed roads. The rivers became barriers, and bridges were built to cross them. Ditches were built to drain swampy areas. Streams were sometimes dammed up to form millponds, and the power of the water turned grist mills or saw mills. These activities changed the look

of the landscape and impacted ecosystems. Habitats were destroyed and organisms were displaced.

People generate waste

Like all plants and animals, humans generate waste. Large amounts of human waste can affect the quality of groundwater, but human waste is only part of the story. Human activities usually generate some leftover materials or trash. Trash takes up space and can pollute the environment. Fires and engines give off fumes and smoke that can pollute the air. Materials added to the soil can leach out into groundwater or run off to pollute streams.

Thinking Like a Geographer

- Settlements of Native people were usually small - less than 300 people. Use what you know about ecosystems to explain why larger villages would have been hard to sustain.

- In early times, people dammed up many streams in Delaware to manage flooding and to supply water power. What would happen if these dams were removed?

- What are some ways people handle trash to control its impact on the environment?

- People in the past have released exotic pets into waterways. Why is this a bad idea?

Humans Impact Ecosystems at Trap Pond State Park

Visitors to Trap Pond State Park often mention its natural beauty. Most of the time, the pond seems peaceful and undisturbed. The bald cypress trees and pines whisper in the wind, swans and geese wheel overhead or glide along reflected in the tea-colored water. But this pond is not "natural." It is the result of human activities that changed the flow of water in this landscape. For hundreds of years humans and their activities have impacted the ecosystems in this place.

Four hundred years ago, this land was part of a cypress swamp. When rains were frequent, standing water could be seen between the trees. In drier seasons, the moisture retreated and the spongy surface between supported small plants and mammals. Native people visited occasionally to hunt, especially in the winter season. They gathered forest products for use in building shelters and simple tools.

Early European settlers valued the cypress trees because the lumber resisted rot. It made strong, durable houses, and could be cut into long, thin shingles for roofing and siding. But working in the swampy woods was hard for men and oxen. Another problem was the lack of power for machinery to saw logs into boards. To solve both problems at once, settlers built a dam across the main stream of water in the area. A pond formed behind the dam, and the water in the pond provided power for the millwheel connected to the saw blade. Ditches were dug to drain

water from the woods to the pond. As the wooded areas dried out, it was easier to cut down the trees and drag them to the pond. Then they could be floated toward the saw mill. Gradually the area around Trap Pond dried out and fields were cleared for crops and pasture. When all the trees were cut down, there was no more need for the old sawmill, and it fell into disuse.

In the 1800s, most people in the area around Trap Pond worked hard to make their living as farmers. They joined their neighbors for church services and social events. There were a few general stores, but most people traveled by horse and wagon to Laurel for shopping or to Georgetown for legal business. During this time, someone noticed that some cypress trees were buried in the silt at the bottom of the pond. For a brief time the men of the area made some money by pulling the logs out of the muck. Because the cypress wood resists rot, they were still solid and could be cleaned up and sold as lumber. But the supply of trees lasted only a short while and the boom was soon over.

During the 1930s, hard times came to America. The government started a program to give work to young men who had no jobs. Young men who worked for the Civilian Conservation Corps (CCC) were sent to Trap Pond. Their job was to build a new dam and construct a park facility. Besides the new dam, they built a sturdy picnic pavilion out of cypress logs and a log cabin home for the park caretaker. In 1951, Trap Pond became the first Delaware State Park. Over the years it has added facilities for people who want to have fun and learn about nature. The new Bald Cypress Nature Center has exhibits that tell the story of Trap Pond and its ecosystems.

Surrounded by woodland and protected from the dumping of trash, plants and animals at Trap Pond seemed secure. Yet there were signs of trouble. At times large numbers of fish died in a “fish kill.” Naturalists checking the water of the pond found fewer aquatic organisms. What was causing this change? Water quality testing showed that pollution was entering the pond. But where was it coming from?

Investigation led scientists to farms in the area that were near streams. The farms raised livestock, and run-off from these farms carried polluted water into the streams and then into Trap Pond. The scientists worked with farmers to keep polluted run-off from entering the streams. Better management of waste from the farms led to a big improvement in the water quality at Trap Pond. When water quality improved, ecosystems at Trap Pond became healthy again.

Ways People Impact Ecosystems	Examples From the text
People remove resources (plants, animals or non-living material)	
People introduce new plants, animals or microorganisms	
People alter topography, change the flow of water	
People produce waste and/or pollution	
People conserve or manage resources	