



GEOLOGY



HISTORY



WATER



BIODIVERSITY

HUMAN IMPACTS  
& CONSERVATION



THE PINE BARRENS:

**Close**<sup>UP</sup>  
& **Natural**  
INQUIRY BASED CURRICULUM

# Human Impacts & Conservation

# Human Impact & Conservation

**D**isturbance is a natural and necessary aspect of a working ecosystem, and the Pine Barrens is no different in this regard. Natural disturbance, principally wildfires and storms, create openings in the forest canopy, allowing plants that cannot grow in the shade of a mature forest to flourish. Wildfires also return nutrients to the soil, in the form of ash, and help to shape the plant and animal communities by favoring those species adapted to survive and benefit from fires.

Human disturbance of the ecosystem began with Native Americans, who are known to have used fires to alter forest habitats in ways they found advantageous for the wildlife, like deer, which they hunted in the Pine Barrens. Today's human disturbance in the Pine Barrens includes a wide variety of impacts, including:

- Forestry (cutting down trees),
- Development of land, replacing forests with farms, houses, malls and roads, with resulting loss and fragment of forest habitats,
- Alteration of water quality (both surface and ground water) through addition of nutrients, toxic chemicals and other pollutants,
- Draining of aquifers and surface waters, Suppression of wildfire, and
- Vandalism from irresponsible Off-Road Vehicle use, collecting of plants and animals, and dumping of waste on the ground.

## FORESTRY

Forestry is the only one of these human disturbance that may have some positive ecological impacts, such as creating openings in the forest, if it is conducted in a manner that ensures native forest communities are permitted to regrow after trees are cut and removed. The impacts of forestry on Pine Barrens habitats has received little scientific study, but it is important to remember that the Pine Barrens we have today is the result of a forest that

was repeatedly cut and permitted to regrow since the early days of European colonization.

## DEVELOPMENT AND FRAGMENTATION

Development of land has a direct impact by replacing forests and meadows with buildings, roads, lawns and farms. Even low-density or scattered development may fragment the forest with buildings and roads. Most native species of plants and animals do not thrive in close proximity to development. Many bird species, for example, will not breed in even a relatively wooded housing development. Many Pine Barrens plants will not grow and reproduce if native soil is altered with additional of topsoil, nutrients or other chemicals that accompanies development. In the 930,000-acre Pinelands Area today, only about 11% has been replaced with urban, or industrial development, and approximately 7% has been replaced by monoculture farming. Forest still claims about 54% and wetlands about 28% of the Pinelands Area.

The impact of this direct loss of habitat has not been quantitatively measured, and would be very difficult to measure, in terms of plant and animal population changes. However, several species that were considered abundant in the past have become far less abundant in the region today. For example, Botanist Witmer Stone found White-fringed orchids were very abundant in Pine Barrens savannas in the early 1900's, but today this spectacular flower is a rare find, apparently due to the conversion of streamside savannas to commercial cranberry agriculture. In addition, the combination of hunting and diminishing habitats have led to the extirpation, or near extirpation, of black bear, wolves and bobcat from the Pinelands. One bird species, the Heath hen (*tympanuchus cupido cupido*) was exterminated as early as 1870 from the Pine Plains through unrestrained hunting.



*Pitch Pine resprouting*

## WATER QUALITY CHANGE

Alteration of water quality is a far less visible, but equally harmful, form of human disturbance to the Pine Barrens ecosystem. If distinctive Pine Barrens plant and animal communities are created and sustained by the harsh chemistry of the soil and water, what should we expect to happen when that chemistry changes? The New Jersey Pinelands Commission's science program has been studying Pinelands watersheds to gauge how well the Pinelands Comprehensive Management Plan is working to preserve healthy Pine Barrens plant and animal communities. The scientists began this initiative in the Mullica River watershed.

The Mullica River watershed is mostly undeveloped (only about 15% of the entire watershed is developed or farmed), but there is intensive development of its western headwaters area. In a series of related studies, the scientists looked at Pine Barrens streams whose drainage areas were completely undeveloped - that is, pristine streams - as their reference points for undisturbed Pine Barrens ecology. The scientists recorded the chemical characteristics of the water for pH, nitrogen and other factors. They also examined the plants growing in and around the streams, the fish species living in the water, and the frogs calling in the immediate vicinity. They compared their results with the work of earlier naturalists and other modern scientists who have detailed the plants and animals of the Pine Barrens. In this way, the scientists developed a picture of a Pine Barrens stream ecosystem unaffected by development or other disturbance of the land. This picture of an unaltered stream became the reference point or baseline against which they would compare other streams in the watershed.

The baseline picture of a pristine Pine Barrens stream habitat included average pH of 4.4 (very acidic). The stream vegetation was made up of plants that botanists early this century identified as native to the Pine Barrens. The fish species they found were limited to the native varieties discussed earlier, such as Blackbanded Sunfish and Pirate Perch. Frogs were also restricted to the native species as well: Pine Barrens Treefrog, Green Frog, Southern Leopard Frog, Northern Spring Peeper, Fowler's Toad, and Eastern Spadefoot.

With their baseline picture of conditions in an undisturbed stream basin, the scientists went out to survey numerous additional stream locations for these same factors of pH, plants, fish and frogs. The results of these studies are striking, but not surprising.

With respect to pH, the Pinelands Commission scientists found a strong correlation between pH and high levels of nitrogen (in the form of nitrate),

on the one hand, and human land uses, on the other. Based on these results, the Pinelands Commission scientists concluded that "Water-quality conditions recorded for the 26 stream sites clearly related to watershed conditions. ... The strikingly different characteristics of the reference-stream sites and the degraded-stream sites illustrate the effect of land-use patterns on Pinelands water quality." (Zampella et al. 2001)

With respect to stream vegetation, the Pinelands Commission scientists found that stream watersheds with a higher percentage of development, pH and nitrate concentrations also had differences in the composition of the plant communities growing in and along these streams, when compared to acidic, low-nutrient reference streams. The scientists derived a list of 36 "disturbance-indicator" species, meaning those species that were consistently found at stream sites whose basins were relatively heavily developed. In every case, the more human disturbance in the stream basin, the more non-native, disturbance indicator plants they found there.

With respect to fish, the Pinelands Commission scientists conducted a similar study to the one for stream vegetation comparing the fish species they caught at several undisturbed reference sites with those they found across a broader range of disturbed and undisturbed streams. Disturbance was again measured in terms of pH and specific conductance of the water in the streams and development in the streams' drainage basins. The scientists then studied 54 stream and 30 lake sites, ordered these sites according to the same disturbance/non-disturbance factors they used in the plant studies, and plotted the occurrence of the fish species at these sites. They found that nonnative species only appear at sites that are high on the scale of disturbance factors of high pH and suburban/urban development of the drainage basin. The scientists concluded that the species composition of fish communities provide an excellent indication of water quality changes in Pine Barrens streams and lakes.

It is important to notice that altered stream habitat does not just mean we find species of plants and animals that are not native to the Pine Barrens. It also means we do not find the native species, or do not find them in the abundance they naturally would enjoy. In some cases, individual species may be entirely displaced by invasive species that normally could not prosper in the Pine Barrens. For example, Pinelands Commission scientists have found that in altered habitats Pine Barrens Treefrogs - the emblem of the New Jersey Pine Barrens - disappear, while Bull Frogs, a large non-native species, invade. This suggests that Bull Frogs probably displace the much smaller Pine Barrens

Treefrogs. Similar displacements may be occurring with other species of plants and animals, where non-native species eat or out-compete natives.



*Pine Barrens Treefrog*

What is causing these changes in water quality and natural communities in waters near developed or farmed areas? The principal agents are nutrients and liming compounds. Because the availability of nitrogen and phosphorous in forms that plants can use tends to be the major factor limiting plant growth, fertilizers containing these chemicals are applied to farm crops and residential lawns in developed areas. And because the naturally acidic soils of this area tend to inhibit the growth of non-native food crops and lawn grass species, farmers and residents often put liming compounds on farm fields and turf to neutralize the acidic pH of the soil. In practice, these treatments are not very efficient - that is, much or most of the chemicals applied do not remain in the top soil and are not used by the plants growing there, but instead are washed through the sandy subsoils into the Kirkwood-Cohansey aquifer. Soon they are transported through the ground to streams and wetlands. Those streams and wetlands closest to where the chemicals are applied receive most of the chemical input, and are most dramatically affected by the ecological changes these chemicals bring about.

Another source of nitrogen can be found in the thousands of septic systems in people's homes. Septic systems generally do not treat the human waste we flush into them, but instead simply allow it to seep gradually into the soils. The effluent from our homes includes lots of nitrogen from our bodily wastes, as well as metals, household detergents and many other chemicals. Some of these contaminants are filtered and retained in the soil, but, especially in the sandy soils of this region, much is transported through the aquifer into streams, wetlands, wells and, ultimately, the coastal estuaries.

The full range of impacts that fertilizers, liming and septic effluent have on ground water quality is not yet well understood. But these impacts appear

to be complex and extensive. For example, scientists with the United States Geological Survey have found that nitrogen, calcium and magnesium leaching from fertilizers and lime enter the water table and cause naturally occurring radium - a radioactive molecule - to break away from soil particles to which it is normally attached and move with the flow of the aquifer through the ground, ultimately entering wells that pump water from the shallow aquifers. (Szabo & DePaul 1998) As another example, there is evidence that, in addition to the direct discharge of compounds like nitrogen, septic systems may interact with pollutants deposited from air pollution to release mercury into the aquifer. Such a process may explain why as much as 10% or more of wells in the Kirkwood-Cohansey aquifer are testing positive for dangerously high levels of mercury. The long-term environmental effects of contamination such as radium and mercury have yet to be studied.

### **DRAINING OF SURFACE WATERS AND AQUIFERS**

Reported withdrawals for water supply from the Kirkwood-Cohansey aquifer system exceed 34 billion gallons per year, much of it from the Pinelands. Studies have shown that depletive ground-water withdrawals can reduce the flow of Pinelands streams, as well as lower the water table. Indeed, this is already occurring. The extent to which the water table has been lowered on a regional basis is a matter of uncertainty and controversy.



*Cedar Creek*

In addition, semi-confined aquifers, like the Atlantic City 800-foot Sands, are fed in whole or in part by water leaking down from the Kirkwood-Cohansey aquifer system above them. Overuse of these deeper aquifers and the Kirkwood-Cohansey on which they depend has steadily lowered their water levels to below sea level over wide areas that

extend into the Pinelands, and resulted in saltwater intrusion in some areas to the northeast, west, and in Cape May County. The falling water levels in deeper aquifers also increase the downward leakage of water from the overlying Kirkwood-Cohansey aquifer, so that less groundwater is available in this shallow aquifer to feed Pinelands streams. Other more fully confined aquifers, such as the Potomac-Raritan-Magothy (PRM), depend for replenishment on small areas of land near the Delaware River, where these aquifers slope up to intersect the surface. The PRM is a major source of fresh water. During the 1980's, in response to an unsustainable, depletive level of exploitation, the New Jersey Department of Environmental Protection (DEP) established two water-supply "critical areas" centered around Camden County and eastern Monmouth County. This designation mandated that withdrawals from affected aquifers be reduced, shifting demand to other less heavily exploited aquifers.

The pressure on all the available aquifers has led to the adoption of alternative means of supplying freshwater for human use and consumption. One such alternative was the construction of a desalination plant in Cape May County that converts brackish groundwater to drinking water. This plant can produce up to 3 million gallons of drinking water a day. The state is now working to increase the use of sewer plant effluent for irrigation, hoping to reduce the demand on water in the aquifers while also returning more of the water that has already been used back to the Kirkwood-Cohansey aquifer.

In many areas, the Kirkwood-Cohansey aquifer system is being considered as one alternative source of water supply, where deeper aquifers are over-taxed. This is not a new idea. One of the main reasons why Joseph Wharton purchased so much land in the Pine Barrens in the late 1800s was that he planned to build a series of shallow ponds, reservoirs and canals, and sell the water from the vast underground water reserves to the City of Philadelphia. Fortunately, the New Jersey State Legislature learned of his plan and passed a law prohibiting the exportation of any of the state's water outside state boundaries. This concern of exporting water outside the Pinelands still exists today, however, since by law water can be sent 10 miles beyond the Pinelands. This is a vast area, and is one of the threats to the future viability of the Pinelands.

### **SUPPRESSION OF WILDFIRE**

The ecological effects of our modern suppression of wildfire have not yet been well studied. However, the decline of species adapted to natural successional habitats is apparently attributable in



*Pine Barrens Wildfire*

part to fire suppression. For example, Wild Lupin was described in 1911 as "one of the most conspicuous" native wildflowers of south Jersey's outer coastal plain, and as "frequent" in a 1983 publication, but today is listed as a "species of concern" by the state Natural Heritage Program due to its increasing rarity. Similarly, Virginia False Gromwell is thought to have been virtually lost and is now listed as endangered by the Natural Heritage Program. In addition, scientists expect that continued wildfire suppression, and the use of only very low-temperature, cold-season controlled fires, will over time change the composition of Pine Barrens forests by favoring oaks in their competition with pines for dominance of the forest. This potential fundamental alteration of the ecosystem will be gradual and will only be visible over a period of several decades or more.

### **VANDALISM FROM IRRESPONSIBLE OFF-ROAD VEHICLE USE, COLLECTING OF PLANTS AND ANIMALS, AND DUMPING OF WASTE ON THE GROUND**

The impacts of irresponsible Off-Road Vehicle (ORV) use and dumping of waste by individuals are evident in most of the Pinelands' State Parks and Forests. ORVs, including motorcycles, quads and trucks, often destroy stream banks, tear up wetlands and destroy rare plant populations. Although it is illegal to ride these vehicles off road on public lands, and on private land without the owner's permission, there is little or no enforcement of these laws due to both resource shortages and the difficulty that traditional law enforcement officers have in catching illegal riders. Even in the most isolated parts of the Pine Barrens, one is likely to come across someone's private trash dump, whether on public or on private lands. This trash often includes toxic materials, such as oil and other chemicals, that leach into the water table. While the cumulative impacts of this dumping are probably impossible to measure, water testing in the region often turns up

ground water contamination with pollutants such as volatile organic compounds (VOCs), long-lived pesticides, mercury and solvents.

The collecting of rare, threatened and endangered plants and animals is another form of human impact carried out by individuals. Collectors seek out animals such as Timber Rattlesnakes, Corn Snakes and certain turtles for the pet trade or for their own pleasure. Others collect rare orchids and other wildflowers. Again, it is impossible to judge the cumulative impacts of this activity on the abundance and distribution of the species being collected, but anecdotal evidence suggests that collecting is rampant, and has been for many years, in the Pinelands.

## THE MOVEMENT TO SAVE THE PINE BARRENS

The popular movement to save the Pine Barrens ecosystem from the impacts of development really got started in response to an extraordinary proposal to build a massive airport and city in the heart of the Pine Barrens in Ocean and Burlington Counties.

In 1958, the Burlington County Freeholders endorsed and publicized a proposal to build an international airport that would occupy 16,000 acres in Lebanon, now Brendan Byrne State Forest. The federal government refused to fund the planning for this project, deeming it not practical. In 1959, however, the Port Authority of New York and New Jersey announced plans to build a huge new airport in the Great Swamp of Morris County in northern New Jersey. This proposal sparked intense opposition from people living in the area, leading the Port Authority to look into other possible locations. Taking advantage of this opening, the Burlington County Freeholders renewed their efforts to site an airport in the Pinelands, forming a Pinelands Regional Planning Board and winning the support of many state legislators and the entire New Jersey Congressional delegation. In response, environmentalists and sportsmen formed the Citizens' Committee to Save State Lands, which began a letter-writing and publicity campaign to raise public awareness about the airport issue and other proposed uses of public lands for development.

In 1962, the Pinelands Regional Planning Board hired a consultant named Herbert Smith to help it make the case to the Port Authority that the Pine Barrens was an excellent place for the new airport. Smith created a development plan that called for building the largest airport in the world. Covering over 32,500 acres, this airport would be 4 times larger than Newark, Kennedy and LaGuardia airports combined. The plan also called for building a

“New City” from scratch, which would occupy an additional 10,000 acres and provide housing and employment for 250,000 new residents. The airport was to be located on the West Plains and would have destroyed the dwarf pine forest there. The New City was to be located on the Forked River Mountains, and would have destroyed that area's plant and animal communities.

Then Governor Richard Hughes led the effort to promote this plan over the next several years, but its proponents were never able to persuade the federal government to adopt the plan. Simultaneously, conservationists successfully advocated to the United States Department of Interior to take steps to protect the Pine Barrens as a National Monument. As a result of this effort, the Department of Interior assigned the National Park Service to perform new ecological studies of the Pine Barrens.

In 1967, John McPhee published his book *The Pine Barrens*. At the time, he was not optimistic and expressed the feeling of many that, because of conflicting land-use interests, the Pine Barrens would not be protected. At the end of the book, he wrote: “Given the futilities of that debate, given the sort of attention that is usually paid to plans put forward by conservationists, and given the great numbers and the crossed purposes of all the big and little powers that would have to work together to accomplish anything on a major scale in the pines, it would appear that the Pine Barrens are not very likely to be the subject of dramatic decrees or acts of legislation. They seem to be headed slowly toward extinction. In retrospect, people may one day look back upon the final states of the development of the great unbroken Eastern city and be able to say at what moment all remaining undeveloped land should have been considered no longer a potential asset to individuals but an asset of the society at large perhaps a social necessity.”

Also in 1967, the National Park Service commissioned Dr. Jack McCormick to conduct new ecological studies, focusing on the 365,000 acres of land proposed for the airport development. Dr. McCormick recommended that the United States recognize 160,000 acres of the Wading River watershed and an additional 8,000 acres of wetlands in Wharton State Forest as National Landmarks. The Secretary of Interior's Advisory Board on National Parks, Historic Sites, Buildings and Monuments then asked the National Park Service to develop a plan to protect the Pine Barrens' ecological values.

Soon afterwards, the National Park Service issued a report which recommended against creating a large national park or national monument as the means to protect the Pine Barrens. The agency instead recommended protection through regional

land use planning – that is, controlling development on a regional, rather than a local, scale. The agency suggested four possible options that varied by the size of the area to be included and the role of state and federal governments in the process. The proposals included one to create a national scientific reserve of 175,000 or 245,000 acres; one to create a state forest or national recreation area of 267,000 acres; and one to create a state-managed Pinelands Region of 373,000 acres.

By 1970, the federal government and the Port Authority had both decided a new international airport in New Jersey was not needed, instead choosing to focus on expanding the existing airports in the New York metropolitan area.

In 1972, the New Jersey state legislature created the Pinelands Environmental Council (PEC). The PEC was charged with protecting the Pine Barrens environment, and particularly its ground water resources, and to protect farming, over an area of 320,000 acres in Burlington and Ocean Counties. It was empowered to develop a comprehensive land use plan, and to review development projects for substantial conformance with the regional plan, but the PEC had no actual power over development; its decisions were purely advisory, and real control still lay with local, municipal councils and planning boards. In 1975, the PEC issued a draft regional plan to the public. This report was so controversial that it led to a stalemate and prevented the PEC from having any further significant influence. The plan strongly favored development of most of the planning area and concluded that the 320,000 acre planning area could accommodate 167,000 new housing units and about 500,000 new residents. At the time, the total population of this area was about 7,500 people. The Commissioner of the Department of Environmental Protection, in a letter to the PEC chairman, described the plan as “a land-speculator’s dream.” Conservationists condemned the plan. After the plan was released, the state refused to appropriate any further funds for the operations of the PEC.

During these years of debate, development was

growing rapidly around, and within, the Pine Barrens. Suburban sprawl became the dominant model for development across the country, and New Jersey was certainly no exception. In 1972, a developer proposed a huge 80,000 person development on the Wading River in southern Burlington County. The township rejected the proposal because local officials and residents were dedicated to protecting their Pine Barrens environment, but the proposal indicates the scale of interest in developing the region’s vast forests. In 1976, New Jersey legalized gambling in Atlantic City, based on the expected economic benefits that would come from a revitalized and booming city on its coast. Public officials and developers looked to the mainland outside Atlantic City to absorb the great population growth they anticipated the casino industry would bring to the region.

During the 1970s, environmental activists and state government officials committed to protecting the Pine Barrens continued to seek the help of the federal government’s Department of Interior. The Administration of President Jimmy Carter supported this goal. In 1976 the Interior Department issued a key report that advocated

preservation of the Pine Barrens, in light of its extraordinary natural resources, through a regional development-control plan, with both federal and state roles. That same year, New Jersey Governor Brendan Byrne publicly endorsed the preservation goal and created a Pinelands Review Committee. He charged this Committee with setting the Pinelands boundary and devising a plan for state actions to protect the region’s resources. The Committee recommended, and the Governor endorsed, the idea of creating a new state commission with the power to control development throughout the Pinelands – not just an advisory body.

New Jersey’s Congressional delegation now led the effort to win national legislation to provide a foundation for preserving the Pinelands through regional land use management. Then Congressman, and later Governor, Jim Florio



*Governor Brendan Byrne at the naming of  
Brendan Byrne State Forest-2002*

sponsored the legislation that ultimately became Section 502 of the National Parks and Recreation Act of 1978. Among three Congressional proposals, Florio’s was the most ambitious, calling for a comprehensive management plan based on protecting natural resources across an area of 1.1 million acres – almost a quarter of the state of New Jersey. The National Parks and Recreation Act of 1978 created the Pinelands National Reserve. Unlike a National Park, where the government owns the land, the concept of a National Reserve was to mark out a large area and institute programs to control development in order to save the area’s natural resources.

The State of New Jersey then took the lead in carrying out this goal when it enacted the Pinelands Protection Act in 1979. With passage of the Pinelands Protection Act, New Jersey and the federal government became partners in saving the Pine Barrens ecosystem and rural landscape. The Act created a special government agency, the Pinelands Commission, to write and implement a land use management plan called the Pinelands Comprehensive Management Plan (“CMP”). The Pinelands Protection Act designated an area of about 930,000 acres within the Pinelands National Reserve as the state Pinelands Area. Development in this Pinelands Area would be under the control of the Pinelands Commission. The rest of the National Reserve was left under the jurisdiction of the Department of Environmental Protection through the Coastal Area Facilities Review Act (“CAFRA”), a preexisting statute which provided very limited development controls in a designated area along the Atlantic and Delaware Bayshore. The Pinelands National Reserve and the CAFRA area overlap along the coast. Because the coastal area was rapidly being developed earlier than the interior of the Pinelands, and because development of the coast for tourism has been seen as essential to the state’s economic prosperity, the coastal portion of the Pinelands National Reserve has always received far less rigorous environmental protection than the 930,000-acre Pinelands Area portion of the Reserve.

### **THE PINELANDS PROTECTION ACT AND COMPREHENSIVE MANAGEMENT PLAN**

The Pinelands National Reserve and the Pinelands Comprehensive Management Plan are laws aimed at protecting the natural resources and ecological systems of the Pinelands and coastal areas of New Jersey. They aim to protect these ecosystems by controlling development. These laws are

the primary (though not the only) tools that government has adopted to manage development and protect natural resources in the Pinelands and coastal area. They are the foundation or keystone of conservation in the Pinelands.

The Pinelands Protection Act is based on the idea of *regional planning* for development and conservation. In New Jersey, as in many parts of the country, decisions about what can be built where are normally made at a local town government level, by volunteer members of local planning boards and town councils. With New Jersey’s relatively small municipalities, this means the use and alteration of the landscape and its resources will be determined on a largely haphazard basis. Decisions to preserve a rural part of one town can be effectively negated by contrary decisions in a neighboring town; different towns may compete with one another for tax-revenue-producing businesses, without regard to the overall impact on natural resources and the character of each community; some town governments are very concerned and knowledgeable about environmental protection, others less so. The Pinelands laws, in contrast, create a single, unified and coherent development and conservation plan for a large area of over 1.1 million acres.

The Pinelands CMP essentially dictates what kind of development or other alteration of the land is allowed to take place in each part of the Pinelands. The CMP says that development can take place in its Regional Growth Areas and Rural Development Areas, as well as in preexisting towns and cities, but little or no development can take place in the Preservation Area and Forest Areas. The CMP also has strong rules to protect the habitats of rare, threatened and endangered species of plants and animals from the adverse impacts of development in all parts of the Pinelands.

The core strategy of the CMP is to direct growth to the periphery of the Pinelands, and into already settled towns and villages, while barring most forms of intensive development in the interior of the Pinelands. It does so by placing the Regional Growth Areas and Rural Development Areas around the edge of the Pinelands, reserving the interior areas for Preservation Area, in which virtually no development is allowed, and the Forest Area, in which only very low density housing development is allowed. Again, these decisions about where to direct growth are made without regard to municipal or county boundaries, but instead based on factors such as natural resources, preexisting settlement and the goal of pressing as much development as possible to the edge of the Pinelands.

The Pinelands CMP also has a set of very strin-

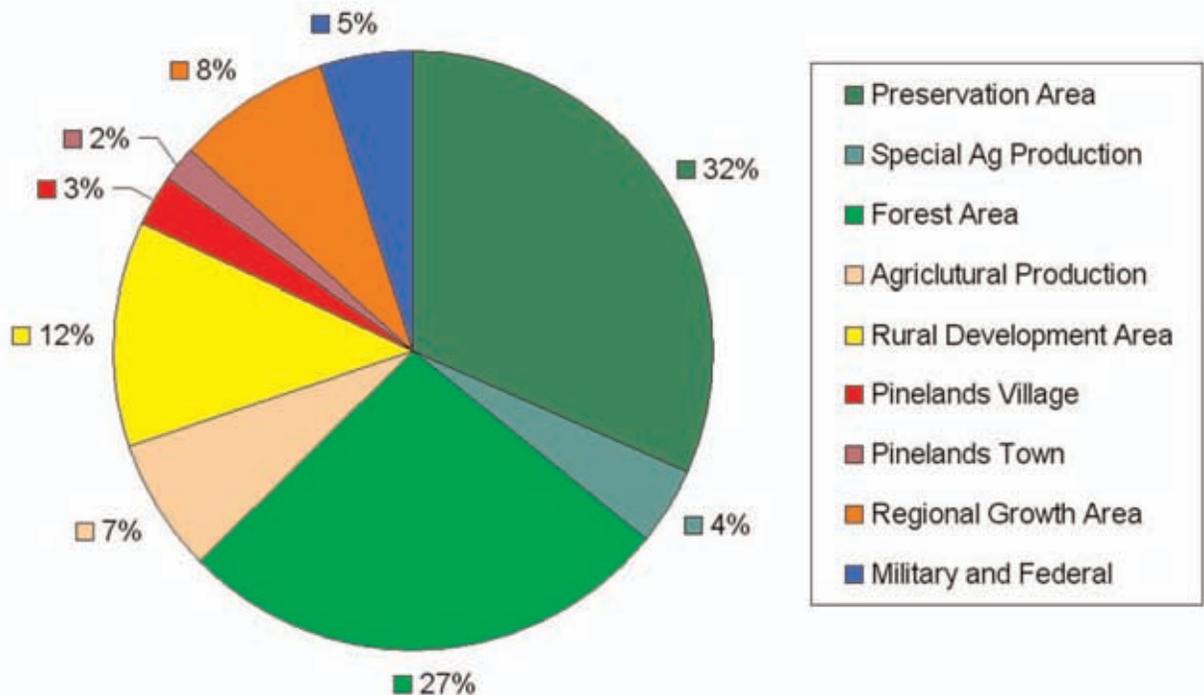
gent environmental standards that apply to development in all parts of the Pinelands. These aim to protect water quality, water supply, threatened and endangered species of plants and animals, cultural resources, and other values. One of the most innovative parts of the CMP is its system for “transferable development rights.” This rule gives landowners in the most heavily regulated forest and farming parts of the Pinelands a “development credit” which they can sell to developers who need them to get approval for certain projects in the growth zones. When a landowner sells these rights, his or her land is then placed under a permanent “deed restriction” against most forms of development. This system both helps to protect land from development in core and farming areas and gives highly restricted landowners a share of the wealth generated by development in the growth areas.

### BUYING LAND FOR CONSERVATION

A vital part of the movement to save the Pine Barrens ecosystem is the purchase of land for conservation. As of 2005, over 400,000 acres within

the Pinelands National Reserve’s 1.1 million acres are held in public or private preserves and parks. This conservation strategy has been built into the preservation effort since the adoption of the National Parks and Recreation Act of 1978, which provided millions of dollars in federal funding to support state purchases of land. The state of New Jersey owns hundreds of thousands of acres in State Forests, State Parks and Wildlife Management Areas in and near the Pinelands. County governments also own some important nature preserves in the Pine Barrens, such as Ocean County’s Wells Mills County Park and Atlantic County’s Estell Manor County Park. Nonprofit organizations have helped preserve many areas that were ultimately incorporated into state and county parks. Organizations such as the New Jersey Conservation Foundation and The Nature Conservancy have preserved and continue to manage numerous preserves in the region. These preserves serve many functions – principally, habitat protection for plants and wildlife, scientific research and education, public recreation and aquifer recharge.

### PINELANDS CMP MANAGEMENT AREAS



# HUMAN IMPACTS & CONSERVATION | Title: Population Circle

LENGTH: 30 | GRADE: 9-12

## OBJECTIVES

*Students will be able to...*

- Describe the trends in human population growth.
- Describe the basic attributes of exponential growth.

## OVERVIEW:

In just under 8 minutes the students will demonstrate the growth of human population in the last 500 years.

## PROCEDURE:

- Draw a chalk circle on the floor about six feet in diameter. Yarn or tape may also be used to mark off the circle.
- Have the students stand around the outside of the circle.
- The activity is based on 24 students. Each student represents 250 million people (approximately the United States population in 1990). Each second represents 1 year.
- Have two students move to the inside of the circle. They represent the world's population in the year 1550 (500 million).
- Using table 1 on the inquiry page count off 5 minutes adding students at the appropriate time.
- Using table 2 have the students draw a line graph to illustrate the history of population growth over this 500-year period.
- Using table 3 have the students draw a line graph to illustrate the history of population growth in New Jersey over the last 210 years.

## MATERIALS:

- Watch with a second hand
- Six-foot circle of chalk, yarn or tape

## NEW JERSEY CORE CURRICULUM STANDARDS

4.3, 4.14 & 5.12

## GLOSSARY

**Population:** All of the people inhabiting a specified area.

**Exponential:** Containing, involving, or expressed as an exponent.

**Million:** The cardinal number equal to  $10^6$ .

POPULATION CIRCLE

# Student Activity

## Inquiry



1. What did you observe about how population changed over time?
2. Towards the end of the simulation, how long was it taking to add 250 million people to the Earth?
3. Based on what you saw happening by the end of the simulation, how do you think this activity would be different if we came back in five years and did it again?
4. What would happen if we continue to grow at this rate?

**TABLE 1**

Year	World Population (in millions)	Total Students in Circle (1=250 million)	Interval to Next Date	Add Participants at the end of this Time Interval	Number of students to Add to Circle
1550	500	2	200 years	3 mins., 20 sec.	1
1750	750	3	60	1 min.	1
1810	1,000	4	80	1 min., 20 sec.	2
1986	1,500	6	41	41 secs.	2
1927	2,000	8	22	22 secs.	2
1950	2,500	10	10	10 secs.	2
1960	3,000	12	15	15 secs.	4
1975	4,000	16	12	12 secs.	4
1987	5,000	20	12	12 secs.	4
1999	6,000	24			

**TABLE 2**

Year	Population
1500	500,000,000 (million)
1600	545,000,000
1700	610,000,000
1800	1,000,000,000 (billion)
1900	1,600,000,000
1930	2,000,000,000
1960	3,000,000,000
1975	4,000,000,000
1987	5,000,000,000
1990	6,000,000,000

**TABLE 3**

Year	Population	Year	Population
1790	184,139	1900	1,883,669
1800	211,149	1910	2,537,167
1810	245,562	1920	3,155,900
1820	277,575	1930	4,041,334
1830	320,823	1940	4,160,165
1840	373,306	1950	4,835,329
1850	489,310	1960	6,066,782
1860	672,035	1970	7,171,112
1870	906,096	1980	7,365,011
1880	1,131,116	1990	7,730,188
1890	1,144,933	2000	8,414,350

*Adapted from Population Circle by Population Connection, Census data from 1790 – 2000 can be found at the following web site. Quality and depth of data varies from data set to data set. Student research can focus on the population trends in greater detail by county or by town and/or region.*

<http://www2.census.gov/prod2/decennial/index.htm>  
<http://www.wnjin.net/OneStopCareerCenter/LaborMarketInformation/lmi25/pub/NJSDC-P3.pdf>

# HUMAN IMPACTS & CONSERVATION | Title: To Build or Not to Build

LENGTH: VARIABLE | GRADE: 9-12

## OBJECTIVES

*Students will be able to...*

- Independently develop an area of the Pine Barrens as specified from a specific Pine Barrens topographic map.
- Compare their plans as they consider the environmental effects of their developmental strategies on the biodiversity, distribution and composition of the community from human and non-human perspectives.

## OVERVIEW

### *Program Description*

Your consulting firm (group) has been hired to suggest ways to develop the area of land outlined by the topographic map set before you. Decisions about the following aspects of community infrastructure must be worked into your plan:

- Current and future size potential of the community.
- Sources of water and energy for sustained community needs.
- Positioning of homes, schools, retail businesses and industry, medical facility, agricultural areas, recreational areas, local governmental services (waste disposal, recycling), public and private transportation routes.

Other suggestions: Factory(ies), Homes (Single, Multiple, Trailer Dwellings), Strip Mall(s), Park(s), Farm(s), Subdivision under construction (w/without Rain Gardens), Parking Lots (impervious surfaces).

Consideration should also be given to runoff from impervious surfaces, waste disposal from home use, hazardous waste disposal from businesses (factories), fertilizers and herbicides from the agricultural areas, recycling initiatives and handling of potential pollution sources.

Each consulting firm (group) is competing for this lucrative contract to construct this “designer community.” Each firm has been asked to be cognizant of the special nature of the Pine Barrens.

## PROCEDURE

**Student participants gain background on their roles.**

- Students should scrutinize their map to gain an appreciation for its topography.
- Students need to read the lines for the highest and lowest points on the map, locate streams and identify their direction of flow, and find the watersheds or areas that drain into any other body of water on the map.
- Students should be cognizant of the regulations governing development in the Pine Barrens. An examination of the Comprehensive Management Plan might be in order.
- Students should be cognizant of the endemic species in the designated area and those native species that are protected by federal and state laws.
- Students should be cognizant of the goals of landowners and developers and municipalities who depend upon fast growth for sources of income.
- Student participants develop their community plan with a goal to be awarded the contract for their “community design.”
- Students present their “community” for input by other “firms.” This can be the assessment if one so intends.

### OPTIONAL ACTIVITY

Students in individual groups can be assigned specific roles. Landscape Architect, Lawyer, Ecologist, Business Person, and Environmental Activist are a few possible choices. In these roles they can assume the perspectives of those individuals as they scrutinize the topographic map and decide upon their community.

### ASSESSMENTS

- Have a copy of a modified topographical map and have students identify various characteristic areas such as elevation, streams, watershed areas.
- Have the lawyer/activists prepare an information sheet on the highlights of the law.
- Teacher organized quiz of factual information.



Webbs Mill Boardwalk

### MATERIALS

- Topographic maps
- Markers or paper to cut and situate building etc. or post its
- Scissors
- Copy of the Comprehensive Management Plan

### NEW JERSEY CORE CURRICULUM STANDARDS

5.1A, 5.5B, 5.8A, B&D, and 5.10A&B

### GLOSSARY

**Biodiversity:** The number and variety of living organisms and ecological communities.

**Contour lines:** The lines on topographic maps that indicate the elevation of the land and are typically ten feet apart.

**Impervious Surfaces:** A surface that does not allow water to drain through it into soil.

**Non Point Pollution:** Any pollution not associated with a distinct discharge point.

**Pervious Surfaces:** A porous surface that allows water to pass through.

**Point Pollution:** Any pollution whose discharge point can be identified.

**Smart Growth:** A term used for well-planned, well-managed development in areas of the state where existing infrastructure can be used to support growth.

**Sprawl:** Ill-conceived land use and poorly designed development that threatens drinking water supplies, consumes open space, spoils landscapes and creates traffic congestion.

**Topographic maps:** Maps that delineates the steepness or contours of the land.

**Watershed:** An area of land that drains into a particular body of water such as a river, lake, stream or bay.

# HUMAN IMPACTS & CONSERVATION | Pinelands, Land Use and Disturbance Indicators

**LENGTH: 3-5 PERIODS | GRADE: 9-12**

## OBJECTIVES

*Students will be able to...*

- Describe the connections between land use and stream systems.
- Describe how land use can increase pH in Pinelands stream systems.
- Describe how increased pH and habitat alterations can result in the presence of non-native species.
- Describe the effects of non-native species on community structure and diversity.

## OVERVIEW

The connections between land use and ecological disturbance continue to be revealed in ecosystems on a global scale. In the New Jersey Pinelands, an ecosystem of unique chemistry, biology and geology, data is being documented pointing to a rather curious relationship. It is a common generalization that regions with greater biodiversity are healthier. Additionally, every chemistry student can reference a healthy pH value in most living systems will be near neutral. Interestingly, in the Pinelands, both higher species richness and elevated pH can be signs of disturbance.

- In this exercise you will inspect a series of GIS maps of a site within the New Jersey Pinelands. Each of the four maps will provide certain sets of data that, when considered together, will reveal a picture of disturbance and land use. Prior to beginning the exercise each student should answer the preliminary inquiry questions on the student activity page. Information can be obtained from Pinelands Preservation Alliance and/ or the Pinelands Commission web sites.

<http://www.pinelandsalliance.org>  
<http://www.state.nj.us/pinelands/>

## PROCEDURE

- Students answer preliminary questions about Pinelands ecology and disturbance.
- Students are given a map of a Pinelands watershed that indicates several sites to be monitored for ecological quality; answer questions posed.
- Students are given a map displaying various land uses within the watershed; answer questions posed.
- Students are given a map of pH values at each test site; answer questions posed.
- Students are given a map of non-native diversity at each test site; answer questions posed.
- Students answer summary questions and discuss overall themes and impacts of disturbance in the Pinelands.

## OPTIONAL ACTIVITY

- Introduce Geographic Information Systems (GIS) to students, data available at NJDEP web site.  
<http://www.state.nj.us/dep/gis/>
- Topographic map instruction – teach students how to interpret USGS maps.  
<http://erg.usgs.gov/isb/pubs/booklets/usgsmaps.html#Topographic%20Maps>

## ASSESSMENTS

- Students type out responses to each question.
- Students review and report on active research projects on the Pinelands commission web site.
- Students put together a PowerPoint or GIS project and construct a poster presentation on non-native species in the Pinelands.

## MATERIALS

- ❑ Disturbance maps, GIS program – Arcview (optional), pH test kit/ probe and Pinelands water samples (optional).
- ❑ Pinelands, Land Use and Disturbance Indicators Student Activity page.



*Aerial View of Forest and Development*

## NJ CORE CURRICULUM STANDARDS

5.1B, 5.5B, 5.6B, 5.10A/B

## GLOSSARY

**Biodiversity:** The number and variety of organisms found within a specified geographic region. The variability among living organisms on the earth, including the variability within and between species and within and between ecosystems.

**Non-native species:** Species of plants and animals that are not native (natural) to an area are known as: non-native species, introduced species, exotic species, non-indigenous species, alien species, transplants, and / or invasive species.

**pH:** In chemistry, pH is a measure of acidity.

**GIS:** Global Information System

**Indicator species:** A species whose presence, absence, or relative well-being in a given environment is indicative of the health of its ecosystem as a whole.

# Student Activity



## Inquiry

1. What are typical pH values found in Pinelands streams?
2. What is the reason for these pH values being so low?
3. What is a native and non-native species?
4. Name and describe four native and four non-native fish found in the Pinelands.

### MAP 1

What is a watershed?

Why are we interested in testing multiple sites within the same watershed?

What do you think the selection of these monitoring sites is based upon?

Are there natural lakes within the Pinelands?

How is a stream different from a lake in terms of habitat and ecology?

### MAP 2

1. Identify and describe the land use types shown on the map.
2. Are the monitoring sites placed so as to detect any potential impacts of all land use types on the map?
3. Access the CMP Pinelands map. List the main management zones and identify which of the regions have specific connections to disturbance. What are the disturbances you would predict to be associated with each management region.

### MAP 3

1. Describe the three pH ranges represented on the map.
2. Is there any relationship between monitoring site location and pH values? Explain.
3. What could cause the elevated values of pH at some sites? Consider land use.
4. Could the elevated values be due to natural phenomenon? Explain.
5. With what frequency should the sites be monitored for pH? Explain.

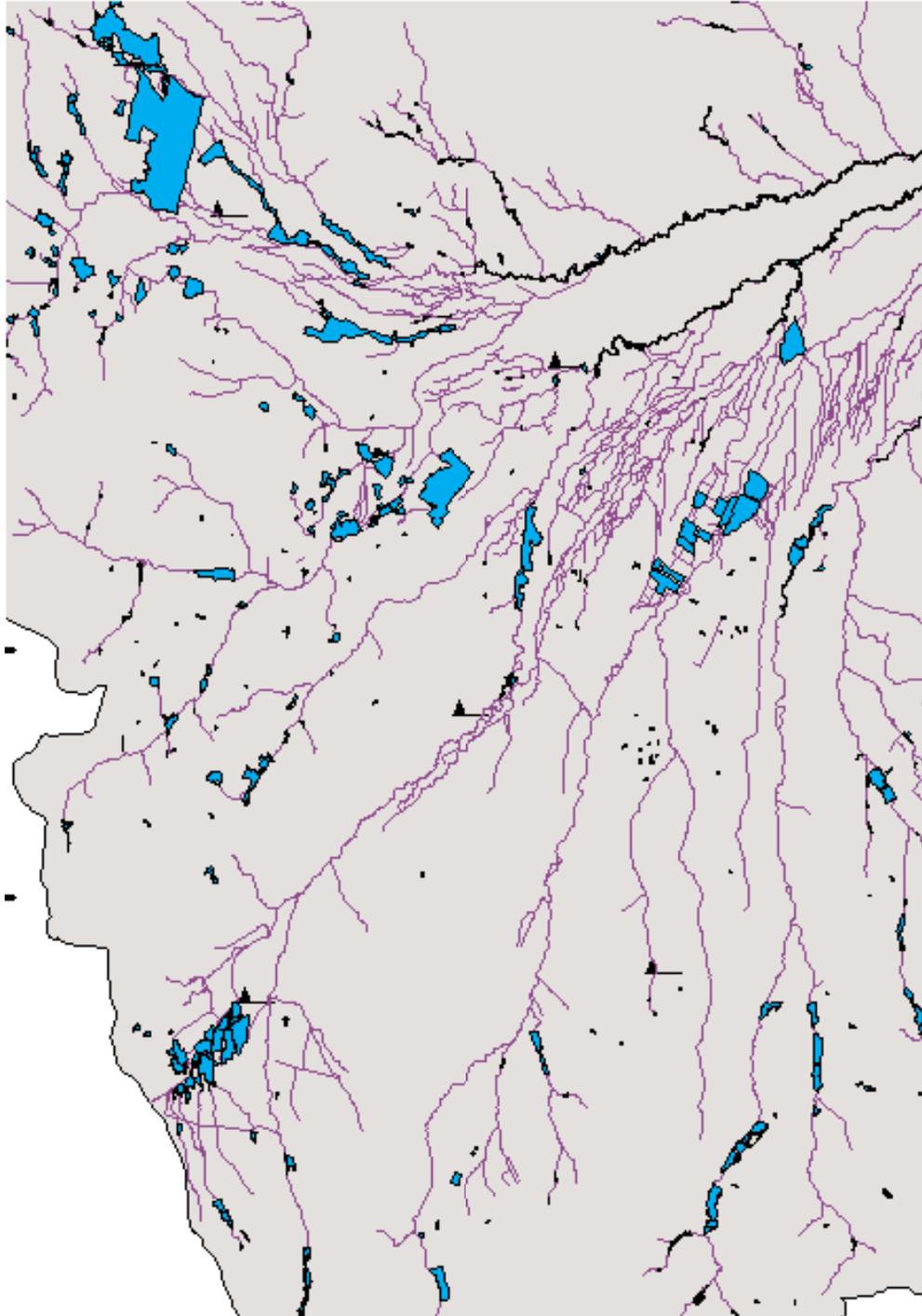
### MAP 4

1. Describe the biodiversity ranking system used for the monitoring sites.
2. Is there a relationship between pH elevation and presence of non-native species? Explain.
3. How could elevated pH alone be primarily responsible for the presence of non-native species?
4. What are the habitat requirements for the non-native species you described above?
5. What is the effect of non-native species (plants and fishes) on the native community?

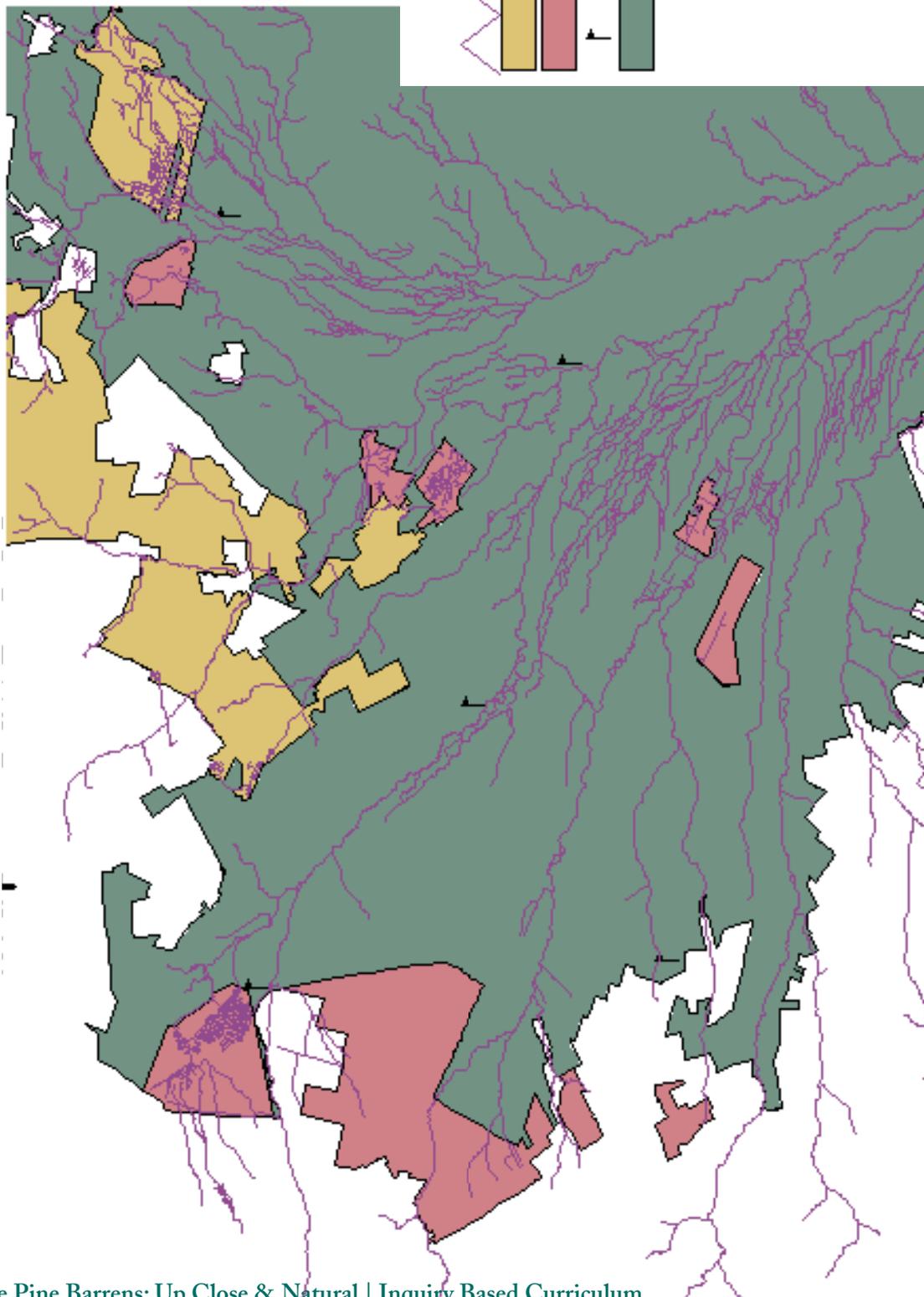
### SUMMARY

1. Give a concluding statement about disturbance, pH and non-native species at the monitoring sites.
2. What could be done at or near these sites to ameliorate the effects of disturbance?
3. Are there other factors you would monitor to help determine the health of a community/ ecosystem and the extent of disturbance? Explain.

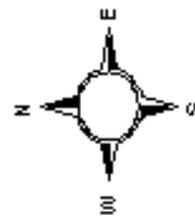
**PINELANDS ECOSYSTEM QUALITY INDICATOR PROJECT  
MAP 1 SAMPLE SITES AND WATERSHED**



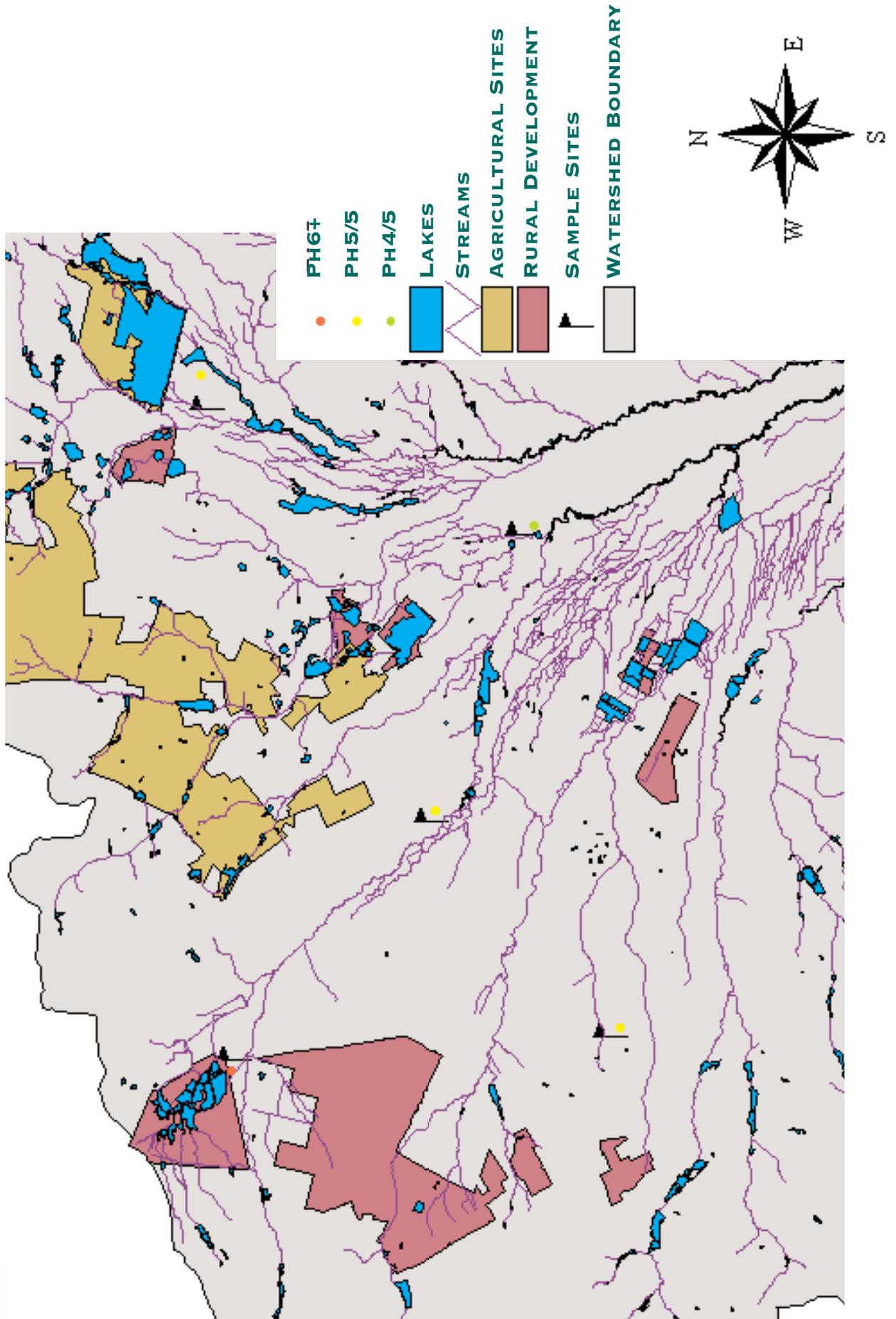
**PINELANDS ECOSYSTEM QUALITY INDICATOR PROJECT  
MAP 2 LAND USE**



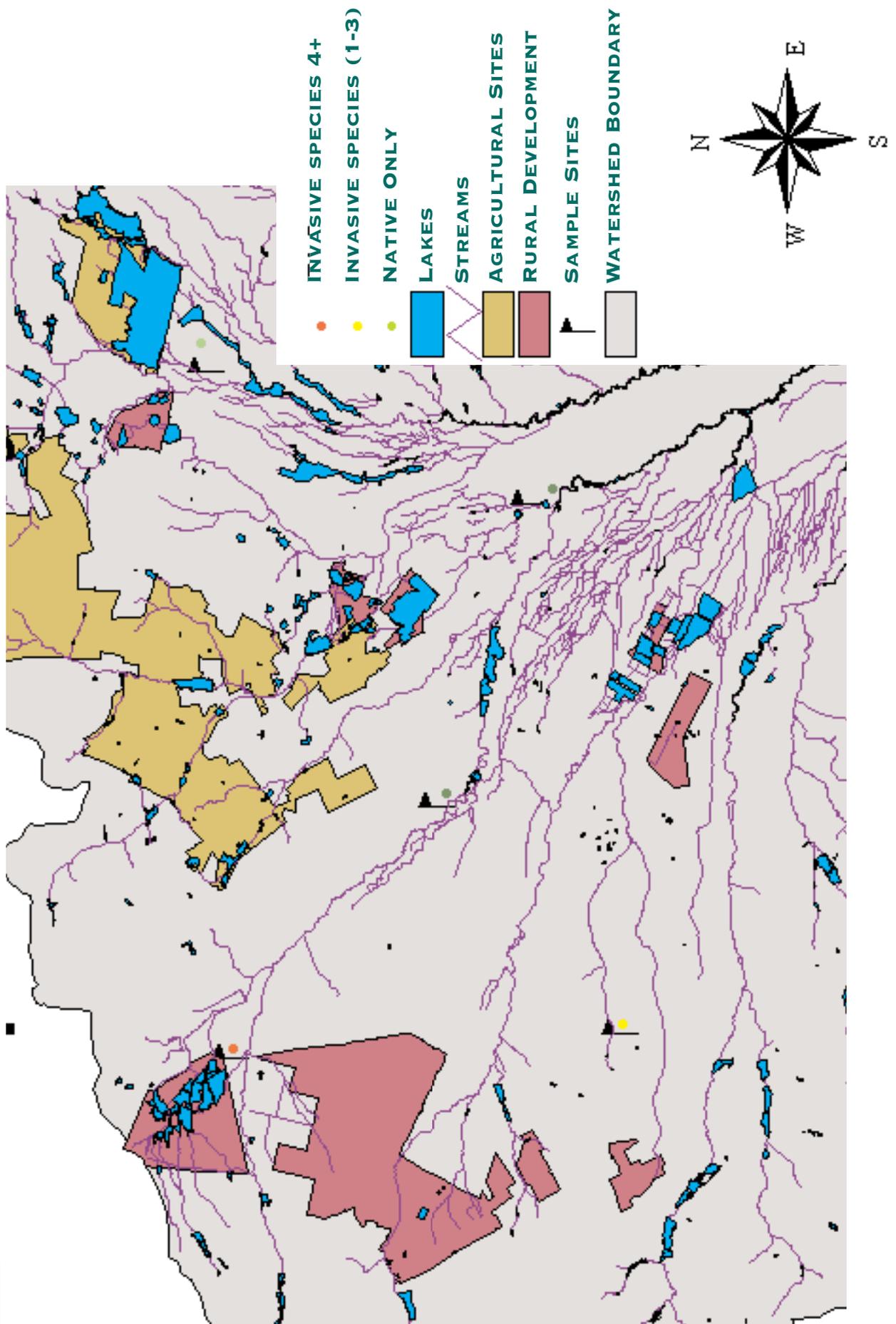
- STREAMS
- AGRICULTURAL SITES
- RURAL DEVELOPMENT
- SAMPLE SITES
- PRESERVATION AREA



**PINELANDS DISTURBANCE INDICATOR PROJECT  
MAP 3 PH VALUES AT TEST SITES**



## PINELANDS DISTURBANCE INDICATORS MAP 4 BIODIVERSITY AT TEST SITES



# HUMAN IMPACTS & CONSERVATION | Built Environment Field Trip

**LENGTH: VARIABLE | GRADE: 9-12**

## OBJECTIVES

*Students will be able to...*

- Identify the various components of the typical suburban built environment.
- Identify the impacts and implications of the built environment.
- Compare and contrast two different examples of the built environment.
- Suggest ways to design the built environment that would have less of an impact on the natural environment.

## OVERVIEW

This suggested field trip is focused on surveying two contrasting examples of the built environment --one that exhibits typical suburban post-war planning and design, and one that exhibits examples of sustainable planning and design.

This suggested itinerary will take students to a suburban housing development in their town, and then to one of the recommended locations listed below. However, the locations can be customized to account for logistical constraints.

## PROCEDURE

### *A. Classroom Preparation*

- Divide the class into working groups.
- Students create a map of the watersheds in which field trip destinations are located. NOTE: Students can use the maps they created during the “Relief Mapping the Topography of Pine Barren’s Watersheds” Lesson in the Water section.
- Have students study the land use and land cover.
- Review the concept of the Transect: the idealized continuum of wilderness, rural, suburban, town, and city. (Student worksheet 1)
- Review the scale of the built environment: region, city, neighborhood, block, street, building. (Student worksheet 1)
- Review examples of most apparent aspects of the local built environment: residential, commercial, roads, bridges, sidewalks, etc.
- Review examples of the less apparent supporting infrastructure: storm water, wastewater, mass transit, etc.
- Review impacts of built environment on: land (water, waste, pollution), wildlife (habitat) and humans (public health).

### *B. Field Trip Itinerary*

- Travel to typical suburban neighborhood.
- Conduct the following area inquiry using Built Environment Survey (Student worksheet 2).
- Examine the setting for topography, vegetation, and human impact.
- Describe approximate % of land cover.
- Describe types of development (residential, commercial?; high or low density?).
- Describe infrastructure (sewer, water, roads, energy, etc).
- Describe any open space or wildlife habitat (relation to developed areas, vegetation, wildlife, buffers between open space and developed areas).

- Describe any waterways (name of waterway, condition of banks, outfall pipes, buffers, etc.).
- Describe means of transportation (car, bus, train, walking & bicycling).
- Travel to location exhibiting elements of sustainable design.
  - Examples include:*
    - Traditional pre-war town centers in and around the Pinelands: including Egg Harbor City, Hammonton, or other pre-war centers like Freehold, Collingswood.
    - Neo-Traditional recent developments: Easthampton Town Center (Eastampton Township, Burlington County) or Washington Town Center (Washington Township, Mercer County).
- Repeat inquiry.
- Have each group review conclusions of Built Environment Survey: Data Worksheet from both sites.
- Have each group present their finding to the class.

## **MATERIALS**

- Watershed map
- Maps of particular Pine Barrens Watershed Regions
- Corrugated cardboard or thin Styrofoam sheets
- Scissors
- Markers/colored Pencils
- Glue
- Student worksheet one and two
- Built Environment Survey: Data Sheet

## **NEW JERSEY CORE CURRICULUM STANDARDS**

5.1, 5.3, 5.4 , 5.5 , 5.8 & 5.10

## **GLOSSARY**

**Map Symbols:** See the USGS for a multitude of official symbols for surface features, mines and caves, vegetations, glaciers and permanent snowfields, water features, building and related features, roads, railroads and others.

**Map Key:** Student designed feature of this activity based upon the Map Symbols chosen for the Relief Map.

**Map Scale:** Is the relationship between distance on a map and the distance on the earth's surface.

**Physical Map:** A map of the locations of identifiable landmarks such as country borders, major cities and significant bodies of water.

**Topographic Map:** A map that shows a surface by contour lines that join points of equal elevation on the surface of the land above or below a reference surface along with symbols that represent features such as streams, buildings, streams and woods.

**Political Map:** A map that shows governmental boundaries of countries, states, and counties, along with major cities. They usually include significant bodies of water.

**Relief Map:** A map that shows the hills, valleys and mountains of a particular area.

**Natural Resource Map:** A map that identifies natural resources that are useful to humans found in a particular area. These resources include food, energy sources, plants and animals for example.

**Contour Lines:** A line drawn on a map connecting points of equal height.

**Watershed:** An area of land that drains down-slope to the lowest point. These drainage pathways converge into streams and rivers becoming progressively larger as the water moves downstream. May be used interchangeably with drainage basin or catchment basin.

**Relative Location:** A location estimated by comparison to something else.



# Student Activity

## Inquiry



### BUILT ENVIRONMENT SURVEY: DATA SHEET

The following checklist will help you to assess the characteristics of your site. Please check all that apply.

Site Name: \_\_\_\_\_

School: \_\_\_\_\_ Date: \_\_\_\_\_

**LAND USE:**

Residential\_\_\_\_  
Commercial\_\_\_\_  
Mixed Use\_\_\_\_

**RESIDENTIAL:**

Single family Detached\_\_\_\_  
Single family Attached\_\_\_\_  
Mix of Single Family,  
Multi- family, Rental\_\_\_\_

**OVERALL DENSITY:**

Low\_\_\_\_  
Medium\_\_\_\_  
High\_\_\_\_

**LOT SIZES:**

acre(s)\_\_\_\_

**PROXIMITY TO TOWN CENTER:**

mile(s)\_\_\_\_  
No Town Center\_\_\_\_

**VARIETY OF HOUSING PRICES:**

Many\_\_\_\_ Some\_\_\_\_ Few\_\_\_\_

**AFFORDABLE HOUSING:**

Yes\_\_\_\_ No\_\_\_\_ Not Sure\_\_\_\_

**PARKING:**

Rear of Buildings\_\_\_\_  
Front of Buildings\_\_\_\_  
On-Street\_\_\_\_  
Parking Garage\_\_\_\_

**INFILL DEVELOPMENT:**

Yes\_\_\_\_ No\_\_\_\_ Not Sure\_\_\_\_

**BROWNFIELDS/CONTAMINATED SITES:**

Yes\_\_\_\_ No\_\_\_\_ Not Sure\_\_\_\_

**REHABILITATED BUILDING/REDEVELOPED**

**SITES:**

Yes\_\_\_\_ No\_\_\_\_ Not Sure\_\_\_\_

**INFRASTRUCTURE**

Wastewater:  
Sewer\_\_\_\_ Septic\_\_\_\_

**STORMWATER:**

Narrow inlets\_\_\_\_  
Vegetated basins\_\_\_\_  
Pet waste signage\_\_\_\_  
Pervious Paving\_\_\_\_

**SCHOOL (WALKABLE FROM SITE?)**

Yes\_\_\_\_ No\_\_\_\_  
Approx Distance:\_\_\_\_  
Recycling: Yes\_\_\_\_ No\_\_\_\_

## LAND USE

---

### TRANSPORTATION AND MOBILITY

**SIDEWALKS:**

Few\_\_\_ Some\_\_\_ Many\_\_\_

**SIDEWALKS/PATHS  
CONNECT SITE TO OTHER  
RESIDENTIAL/COMMERCIAL  
AREAS:**

Yes\_\_\_ No\_\_\_

**TRAFFIC CALMING:**

Textured crosswalks\_\_\_

Speed Humps\_\_\_

Sidewalk bulbouts\_\_\_

**BICYCLES:**

Bicycle Lanes\_\_\_

Bicycle Parking\_\_\_

**ROAD NETWORK:**

Connected\_\_\_

Disconnected\_\_\_

**MASS TRANSIT:**

Bus\_\_\_ Train\_\_\_ Park/Ride\_\_\_

**STATION/BUS STOP, WITHIN:**

1/4 mile\_\_\_ 1/2 mile\_\_\_

1 mile\_\_\_

**OPEN SPACE****PUBLIC OPEN SPACE:**

Yes\_\_\_ No\_\_\_ Type:

**OWNERSHIP:**

Municipal\_\_\_ County\_\_\_ State\_\_\_

**PARK TYPE:**

Passive recreation\_\_\_

Active recreation (sports  
fields)\_\_\_

**PRESERVED LAND:**

Yes\_\_\_ No\_\_\_ Not Sure\_\_\_

**PARKS WITHIN WALKING  
DISTANCE OF SITE:**

Yes\_\_\_ No\_\_\_

Approx. Distance:\_\_\_\_\_

### CONCLUSION

How does this site compare with the other site you have observed?

Do you think this is an example of "Smart Growth"? Why? Why not?

# HUMAN IMPACTS | Title: The Preserve Town Meeting

**LENGTH: 2, 45 MINUTE CLASS PERIODS | GRADE: 9-12**

## **OBJECTIVES**

*Students will be able to...*

- Consider and discuss a variety of issues that surround “The Preserve”.
- Play the role of one of the stakeholders in a town meeting.
- Consider of the stakeholders points of view in developing a resolution to the issue.

## **OVERVIEW**

The Preserve is a development on the edge of the Pinelands in which a local population of endangered Timber Rattlesnakes has been found on. Students are given information related to the rattlesnake case study and put into various groups in order to bring resolution to the issue. Each group will develop and present arguments based on their respective point of view.

## **PROCEDURE**

- Read “The Preserve” Case Study background information together as a class.
- Divide the students into 5 different groups and assign each group one of the roles listed on the Case Study.
- Students will be given time to research and develop arguments that best support the point of view of the role that they were assigned.
- A “town meeting” will be called and each group will be given the opportunity to present their arguments surrounding the case and ideas for resolution.
- The groups will collectively come to a resolution that best satisfies each point of view.

## **MATERIALS**

- Copies of The Preserve Town Meeting Student Activity pages.

## **NEW JERSEY CORE CURRICULUM STANDARDS**

5.1.A.1, 5.1.A.2, 5.1.A.3, 5.1.A.4 & 5.10.B.2

## **GLOSSARY**

**Preserve:** To keep in perfect or unaltered condition; maintain unchanged.

**Hibernaculum:** The shelter of a hibernating animal.

**Endangered Species:** A species present in such small numbers that it is at risk of extinction.

# Student Activity

## TOWN MEETING – THE PRESERVE

### Biodiversity, Land Use and Endangered Species

*“The Preserve”*

**JULY 2003**

The morning sun was a welcome sight. Three days of rain had dampened the spirit of summer. Fifteen year old Justine Kendal waited at the end of her driveway for her ride to soccer practice. Still tired despite a solid nine hours of sleep, she decided to recline to catch another minute of slumber.

Sitting on the warm asphalt, she placed her bag behind her head and stretched to reach the cool grass at the edge of the driveway. She wasn't the only one enjoying the heat radiating from the dark impervious surface.

The Timber Rattlesnake, a young one, maybe two years old, took exception to the clasped hands coming down a bit too close to its head. Normally a rattle would have warned of a coming attack and though this species is rather shy, the bite came quickly.

After spending the morning in the emergency room and learning that the bite had been dry (no venom injected) she returned home with her parents. The next day she bragged to her friends about the incident, but her parents did not take the issue so lightly.

The Preserve is a development on the edge of the Pinelands. Five years ago, permits had been granted for road and sewer line installation. The construction crew reported seeing snakes on several occasion and a local naturalist identified them as Timber Rattlesnakes, a state listed endangered species. Rumors swirled about the developer's attempts to keep their presence quiet – dismissing reports, slipping a few bucks to the construction crew and even enlisting the help of a licensed biologist to sign off that no snakes were present. The state DEP finally addressed the issue and did document snakes and a large hibernaculum in a cedar swamp on the property.

A town meeting has been called to decide the fate of the snakes and the Preserve. Should the development be torn down? Should future building on the large tract of property be allowed? Should the developer be paid for the land? If so, how much? Should the snakes be removed? The 5 groups listed below have been called to this meeting to bring resolution to this issue.



Timber Rattlesnake

### ROLES

- **Pinelands Commission:** A committee of appointees charged with upholding the Comprehensive Management Plan and dealing with necessary conflicts.
- **SAD Development:** The corporation who owns the land and applied for and received development rights.
- **Preserve Community:** People who live in the community.
- **PPA:** Pinelands non-profit that monitors the activities of the commission, the state and all activities in the Pinelands.
- **NJDEP:** Department of environmental protection. State agency responsible for upholding laws and protecting the environment.