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The Green Horizons Careers booklet was sponsored in part by the NYS Department of Environmental Conservation.

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Designer: Leslie Kameny, Kameny Design  
Photos: Brooklyn Botanic Garden, Con Edison, NYS Department of Environmental Conservation

Advisory Committee:  
Susan Gooberman, Environmental Education Consultant  
Mary Kramarchyk, NYS Department of Environmental Conservation  
David McMaster, The F.A. Bartlett Tree Expert Company  
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Dear Students:

Q. Do you like being outdoors? Do you enjoy science and math? How about geography and mapping and natural history? Have you participated in tree-planting at school or at home or perhaps helped to create a flower or vegetable garden? Are you curious about plants or animals?

A. If the answer is “yes” to any or all of these questions, you may be interested in a career in the environment and natural resources. This booklet can be your guide.

We all live in an urban environment that is an exciting place to explore and discover. The careers described in the booklet focus on caring for our environment. Working in one of these jobs will allow you to help create more healthful surroundings and provide a better life for yourself and others. Though each one is described separately, many of the careers overlap; those working in the environmental field often work closely together.

Some of the careers described in the booklet are learned “on-the-job” right out of high school. Others require a professional certificate that can be earned in a year or two. Many of them, such as scientific research, require at least two or four years of college or even graduate school. As you learn more about careers that interest you, one important question will be: how much education do I need to prepare for this job?

In the booklet, there are also lists of high schools and colleges or universities you may want to consider attending. All of them offer courses that can be important and interesting to you. There are also lists of organizations and governmental agencies that provide up-to-date information. As you grow older, you may be able to find internships or summer jobs through the contacts we have provided.

Best of all, the jobs described in the booklet are here in this country. They will not be “out-sourced” or go away. They exist for the present and the future.
What is an Urban Environment?

You may want to think about making one of the careers described in the booklet a part of your future. But, first, you need to know what makes up the special urban environment we are all part of:

Backyards

The closest bit of nature may be the one right next to the front or back of your own house or apartment building. Investigate these spaces for trees, shrubbery, flowers and urban wildlife, such as birds and squirrels.

Parks

Parks are a big part of the urban environment and they provide us with many trees and flowers, lakes and ponds, and places to play. New York City has famous large parks, such as Central and Prospect, but also many smaller parks in neighborhoods across all boroughs.

Closed landfills

New York City used to dump its garbage and trash into large dumps at the city’s edges. Often, these landfills destroyed wetlands that should have been protected. All our landfills are now closed and they are being turned into huge parks and grasslands that help re-create some of the plants and habitats that once were there.

Creeks and rivers

The city has underground creeks that become visible as they empty into surrounding waters. Our one real river is Bronx River, an important food resource and habitat for wildlife all along its path.

The Atlantic Ocean, with hundreds of bays, tidal lands and inlets.

We have miles of shoreline, including many beaches that form our marine environment which supports thousands of special plants and animals that thrive in salty water.

Swamps, marshes and stream banks

These crucial wetlands provide very important habitats for birds and other creatures. They are critical for control of water running off the land and for protection from floods. In addition, special low areas called curbside rain gardens are now being built along streets and in parking lots to capture rainwater before it runs off into the sewers. Rain gardens can help provide water for street and park trees.

Ambient Air

Last but not least is the ambient air around us, which we take for granted but which is essential for life.

Natural Woodlands

The city also has many areas where trees and other plants have grown on their own. Some of them are remains of the landscape that was here before so many buildings, streets and sidewalks were built. New trees and shrubs are now being planted in our woodlands to create a healthier forest.

Street trees

Thousands of trees are planted along our streets. They beautify our neighborhoods and provide cooling shade in summertime. Birds and small mammals such as squirrels obtain food from them. As the trees take in carbon dioxide and put out oxygen from their leaves, they help purify the air we breathe. Street trees are planted by city agencies, by neighborhood groups or by individuals who just love trees and want to see more of them.

Botanical gardens, community gardens, and even cemeteries

These valuable areas provide a combination of lawns, trees, shrubs, flowers and vegetables that create special environmental spaces.

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Many parts of New York City used to be covered in farms and the produce was sold in local markets. But, gradually, the city’s land was sold to become part of business, industrial and housing developments and most farms disappeared. Today, there are farm museums in Queens and Staten Island that allow us to learn about the ways successful farms were run in the “old days.” Modern farming can also be learned at John Bowne High School in Queens, which has special courses, including the raising of small animals.

Over the past few years, farmers have reappeared in New York and a new career in Urban Farming has begun to succeed. Many farmers got their start by actively growing crops in community gardens and decided to find enough open land to grow many more.

**urban farmer**

Many urban farmers got their start by actively growing crops in community gardens and decided to find enough open land to grow many more. They are growing food for their own families, but often sell extra produce at their garden sites or donate to neighborhood organizations that help distribute food to the community.

One successful urban farm is at Snug Harbor Cultural Center and Staten Island Botanical Garden; vegetables from this garden are marketed to small restaurants and a weekly farm stand. Left-over produce is donated to Project Hospitality, an organization that helps the needy. Other botanical gardens also have demonstration gardens staffed by farmers or horticulturists.

Some farmers have even found space to garden on rooftops. Using specially prepared sites that can take the heavy load of soil and water, they have created businesses that support owners and employees and help provide food for various restaurants and markets.

Another new farming technique is bringing back fruit trees to the city in urban orchards. Re-creating stands of fruit trees like cherry and apple that used to be part of many neighborhoods has given an additional way to succeed as a farmer and offer fresh food to city dwellers.

The city’s Green Markets have helped the “locavore” effort become larger, year by year, with over 200 farmers from the city and nearby areas selling their products.

**learn more online**

**Search:** Urban Agriculture, Farming, Urban Orchards, Agronomy

**Water Quality Scientists** and Environmental Engineers have crucial jobs in providing and protecting water for our urban environment. Abundant supplies of clean, potable water are a “must”; humans and animals cannot live without water. Plants cannot grow and survive without water. As cities and their surrounding areas grew over the past 200 years, the demand for water increased. This demand is still growing today.

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Supplies of clean water for large cities like New York City are overseen by Water Quality Scientists who find and monitor water sources.

Once good water supplies have been identified, Environmental Engineers plan and construct the system that brings the clean and monitored water to the users. In the early days of New York City, people relied on underground wells that were soon over-used. The water became polluted and was not safe. Today, like many other cities, we are able to obtain water through a huge system of reservoirs, aqueducts and pipelines that bring supplies to the millions of users, both at home and on the job. Environmental Engineers work constantly on the system that already exists so that proper maintenance is in place. In addition, they plan and construct new parts, such as additional pipelines or treatment plants.

Although most professionals who are in charge of providing clean water work for governmental agencies, there are also jobs for Water Quality Scientists and Environmental Engineers in private industry. Non-profit organizations that help the public oversee clean water systems also employ these professionals.

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**learn more online**

**Search:** Water Quality Testing, Water Supply Systems, Aquatic Science, Environmental Engineering

**Water Quality Scientist**

Supplies of clean water for large cities like New York City are overseen by water quality scientists who find and monitor water sources.
Arborists have special training in the science, planting and care of urban trees. Many of them have studied at colleges or universities, but there are also “learning by doing” certifications from botanical gardens, for example. Companies like Bartlett Tree and Davey Tree accept applicants with high school diplomas and provide “on the job” training.

Most Arborists work “in the field”, meaning in parks or playgrounds or on city streets. They often advise homeowners who want to plant trees in their yards. They work with Landscape Architects and construction companies that need trees to be planted around new or renovated buildings. They work closely with Urban Foresters on many projects.

Some Arborists work for governmental agencies like the city Parks Department or the state Conservation Department. Many work in botanical gardens, such as those in Brooklyn, Queens, the Bronx and Staten Island. Managers at special parks, such as Central and Prospect, also employ Arborists. Non-profit organizations and private companies, employ Arborists, as well.

Once the species of trees for planting have been chosen, Arborist, Urban Foresters and Landscape Architects often travel to plant nurseries to select the best and healthiest trees for their jobs. They are then the “hands-on” people who actually help plant trees into selected sites. They know how large the tree pits should be, how wide and deep to make the hole for planting, and how deeply to plant the tree. Then they make sure the trees’ roots are properly covered and a mulch of wood chips or other organic material is applied. Many times, they add stakes to the trees to help them stand upright during the first one or two years of growth.

After the trees are planted, Arborists and Urban Foresters keep tending them. They water them regularly, especially during the first two years, and keep track of any droughts that may reduce rainwater needed for ongoing growth. During droughts, they often help to organize public campaigns for citizens to help water street trees.

From time to time, Arborists also prune the trees as they grow. They need to take off dead or dying limbs, eliminate branches that interfere with each other, and create more open space for light and air. They know that proper pruning helps trees to grow better and stronger and provide benefits for many years.
Arbor RX: CSI for Healthy Trees
Arboricultural Research

Trees are an important part of our urban environment, but they don’t always have an easy time surviving and thriving in the midst of so many buildings, with acres of concrete and miles of asphalt pavement. Polluted city air makes it difficult for some of them to grow well. Sometimes they aren’t watered enough during droughts or they may receive too much water in a rainy season. But urban trees have proven to be hardy. Despite it all, we are able to enjoy a city with millions of beautiful trees in parks and playgrounds and along the streets. New York City has recently sponsored a successful Million Trees Initiative, in which more than a million new trees have been planted over the past few years. More will continue to be planted every year.

Much of the success of urban trees comes from the work of Arboricultural Researchers. They are highly trained scientists who work for universities and in government agencies or for leading tree care companies. Their information has helped Urban Foresters and Arborists learn to plant the right trees in the right sites and with the right tools and techniques. They learn better care of trees once they are planted, including proper pruning. They are taught to recognize trees that are diseased or possibly dying so they can remedy the situation or perhaps remove the trees before they fall and hurt someone or cause property damage.

Arboricultural Researchers create test sites in their outdoor labs and study the roots, trunks and branches to improve the structures of trees and identify those specimens that show best growth. They experiment with different planting techniques and test how specific trees survive extremes, such as cold and heat. They experiment with differing kinds of soils and measure how much water various tree species may need to thrive. The results are written for publication in printed materials and on the internet for practical use by those working in the field.

Arboricultural Researchers are also relied upon for information about insects and diseases that harm trees by preventing good growth or perhaps causing their death. In addition to their own studies, they are often asked to diagnose these conditions through soil and tissue samples sent to their labs. This information is valuable to all those working in urban forestry, arboriculture, horticulture and forestry, in printed materials, online or by workshop presentations.

Air Quality Scientists are professionals who measure and monitor the air and help us determine its safety. The ambient air surrounding us is vital since we know that clean air is necessary for our life and health. But certain types of pollutants have created problems – many of them invisible by normal sight – and we know that breathing them for a long period of time can be unhealthy. Because air quality is so important, the federal and state governments have special laws and rules to help decide whether air in particular places is safe or not.

Air Quality Scientists are continuing to develop methods to identify pollution and to measure its effects on the health of humans, birds and other animals. They use many instruments to capture the information for study in their labs. They are guided by the air quality rules and it is their responsibility to share their research and findings so that decisions can be determined if air in a certain place is safe for people to breathe.

Air Quality Scientists are working in labs, but also in the outdoors, taking samples that will be analyzed and that form the basis for difficult decisions.

Even if air quality is found to be safe for a particular area, we know that it is affected by air from around the world. Wind and air currents are world-wide, so pollutants from a smoke stack thousands of miles away can affect our air here. Air Quality Scientists confer with others and share data as they help to make decisions. They often publish their findings in scientific journals and on the Internet so they can be compared with findings in other places. This work helps the government review and sometimes change laws and regulations for clean air. Nations are learning to work together on this important issue.

Air Quality Scientists
Monitoring Air Quality
Atmospheric Science

Arboricultural Researcher

Air Quality Scientists

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Air Quality Scientists
Monitoring Air Quality
Atmospheric Science
Exploring Geology and the Earth’s History

Earth Science

Geologists study a special part of the environment – the rocks that lie under the surface of Planet Earth. This is a fascinating field that includes materials such as igneous, sedimentary and metamorphic rocks, as well as minerals and gemstones. Beautiful jewels that become rings and bracelets are found under the Earth. By studying rocks, Geologists can also learn about the history of Earth, providing important information on what life was like in ancient times. They often do their studies as employees of a university or a museum or major science center.

Some Geologists are an important part of the work of construction companies that plan and erect buildings, roads, railroads and bridges. Nothing can be put on top of the ground that cannot be supported by the land structures underneath. Geologists are often the ones who “go first” on major projects.

Geologists also play an important role in energy development by identifying the locations of fossil fuels (such as coal and natural gas) and geothermal (underground hot water) that can be accessed and natural gas) and geothermal (underneath.

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While some of the work that Geologists do is excavating or exploring caves, they are also able to study above the ground, on rocky cliffs or by just picking up stones wherever they are found and bringing them back to labs for observation. The American Museum of Natural History has a large and important collection of rocks that have been studied for many years and are also in exhibits for anyone to see.

New York City is particularly interesting for Geologists because there are so many different types of rocks under the five boroughs. One reason that so many very high buildings can be erected in Manhattan is because of the hard rock known as schist that underlies so much of that borough. The whole city is at the end of the terminal moraine from the glacier that covered much of New York about 10,000 years ago. The terminal moraine is the expanse of boulders and rocky soil that was left behind as the glacier melted. You can see some of the huge boulders left from the glacier in the Brooklyn Botanic Garden and Van Cortlandt Park in the Bronx.

Geology

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Entomology

Scientific research on all aspects of natural life leads to many jobs that establish careers lasting a lifetime. One focus of research is on insects, which are recognized as essential to life on Earth. Entomologists with many levels of education study all types of insects in their habitats; today’s Entomologists study the past natural history and build on this with new experiments and knowledge.

As a vital part of the Earth’s ecosystem, insects have one of the longest life histories on the planet. They inhabit sky, water and land and even combinations of all three. As life evolved, some insects became part of the life of plants; today, many plants depend on insects for their survival. Without insects to pollinate them, most plants, including the food crops that we eat, will not be able to reproduce. Other insects may not survive without food from particular plants. For instance, the Monarch butterfly depends on the food supply from certain milkweed plants.

Insects have also evolved with animals such as mammals. Not only do some insects provide animals with food, but they can also be vectors of disease that may be carried by those animals. Research by Entomologists especially helps to keep the urban environment safe, where so many people live closely together. Insects also play a major part in the life cycles of animals, including helping to dispose of the remains of those who die. Insects such as termites also clean up waste wood and other materials that otherwise would cover the landscape. They are a critical part of biology and ecology and environmental management.

Research by Entomologists is highly connected to the field of medicine, as many serious diseases across the world are caused by the bites or stings of insects. Likewise, agriculture and forestry are highly dependent on scientific information about what insects may help or damage crops and trees. They need help in knowing whether certain insects are helpful or destructive and how to deal with them in an ecological way.

Most Entomologists work for various governmental agencies and their findings are shared world-wide, through cooperation among nations.

Scientific research on all aspects of natural life leads to many jobs that establish careers lasting a lifetime. One focus of research is on insects, which are recognized as essential to life on Earth. Entomologists with many levels of education study all types of insects in their habitats; today’s Entomologists study the past natural history and build on this with new experiments and knowledge.

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Insects have also evolved with animals such as mammals. Not only do some insects provide animals with food, but they can also be vectors of disease that may be carried by those animals. Research by Entomologists especially helps to keep the urban environment safe, where so many people live closely together. Insects also play a major part in the life cycles of animals, including helping to dispose of the remains of those who die. Insects such as termites also clean up waste wood and other materials that otherwise would cover the landscape. They are a critical part of biology and ecology and environmental management.

Research by Entomologists is highly connected to the field of medicine, as many serious diseases across the world are caused by the bites or stings of insects. Likewise, agriculture and forestry are highly dependent on scientific information about what insects may help or damage crops and trees. They need help in knowing whether certain insects are helpful or destructive and how to deal with them in an ecological way.

Most Entomologists work for various governmental agencies and their findings are shared world-wide, through cooperation among nations. Others are on the faculty of universities and colleges, which often have their own outdoor research properties. Valuable information and discoveries are shared in this network, as well. Trained Entomologists also work for corporations whose work requires the control or elimination of harmful insects.
A career in architecture requires a great deal of special training in design and in construction. With few exceptions, most new buildings require a licensed architect to create detailed plans and have them approved by a local governmental agency. In many cases, renovations or changes in older buildings also require these plans. Plans will include how large the building will be, how many rooms or other spaces will be created and what materials, such as steel, bricks or concrete, will hold it up and make it secure.

Environmental Architects are leading other architects and the building industry in the recognition, that houses and other buildings can be built in harmony with ecology and the surrounding environment. Their work focuses on identifying special designs and building materials. They design construction plans that help new houses, apartment buildings and other structures save energy and result in healthier conditions for those who live or work in them.

Environmental Architects choose windows and doors that block out both cold and hot air and save indoor energy. They choose plumbing that limits water use. Solar panels often contribute to heating systems and save fuels or the use of electricity. Special lighting fixtures are energy-efficient and often will automatically turn off when not in use. On the outside, they choose weather-resistant roof and wall materials that will hold up under sun and rain. They can design gutter systems that controls rain water to lead into an irrigation system for the surrounding landscape. They design “green roofs”, particularly for large buildings, where special plants capture water and keep the building cooler. Sometimes these “green roofs” can be used for growing food.

Buildings that are designed with environmental choices may cost more because of the special materials that are used. However, the energy savings over time often help to pay back the extra costs. For example, solar collectors can help owners pay less for electricity and even receive payments or credits for electricity that they provide to the electric company.

The work of Environmental Architects has been nationally recognized. The US Building Council has created certificates under a program called Leadership in Energy and Environmental Design (LEED). Depending on a specific building plan, it can be designated as a Platinum or Gold LEED building and receive state or federal tax credits.

Building “Green” Structures

Environmental Architecture

environmental architect
They are leading architects and the building industry to understand that houses and buildings can be built in harmony with the environment.

They plan “hands-on” lessons, where students learn by their own discoveries, as well as from books and computer information.

Environmental Educators plan “hands-on” lessons, where students learn by their own discoveries, as well as from books and computer information.

They visit the school boiler room and learn about the problems of waste disposal. They visit the school boiler room to learn about how the building is cooled or heated.

Many lessons in environmental education take place outdoors on field trips. Sometimes, students travel to parks or woodlands or beaches to study plants that grow there or animals that live on land or in the water. They are discovering the plants or animals as they live in their own environment or habitat. The students make records of their observations to take back to the classroom.

Other field trips take place in the neighborhood, where students observe trees that are planted on the streets, or study and map the “built environment” of sidewalks, fences or walls that may be covered with plants or create homes for insects or other tiny creatures. No matter how urban it may be, nature will be there in some way.

Many Environmental Educators teach in schools as regular teachers. Others, who have special training, teach at environmental centers in parks or summer camps. Many work for governmental agencies or for non-profit organizations. Environmental education has been recognized as an important part of the education of every student.

Teaching about the Environment

Environmental Education

environmental educator
They plan “hands-on” lessons, where students learn by their own discoveries, as well as from books and computer information.

Science has always been a part of education and teachers have taught it in many ways. Environmental Educators are teachers who are creating new ways of teaching that help students understand the connections to their real life and their surroundings. Teachers and students are part of teams that seek to observe and understand the natural life of their indoor and outdoor environment and how to make it better and sustain it.

Environmental Educators plan “hands-on” lessons, where students learn by their own discoveries, as well as from books and computer information.

They have classroom terrariums or fish tanks for daily observation. They may measure weather and temperature by mounting thermometers or barometers at schoolroom windows. They actively save paper, plastic or metals for recycling and learn about the problems of waste disposal. They visit the school boiler room to learn about how the building is cooled or heated.

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Floriculturists may work as Horticulturists in botanical gardens or parks or museums. They are responsible for the design of exhibits that illustrate themes from nature or literature or the art world. In good weather, the exhibits may be outdoors and feature plants such as a rose collection or designs of shrubbery. Exhibits may also be designed for indoors, such as in a greenhouse, and these are especially popular at winter holiday time.

New York City’s botanical gardens offer outstanding examples of the work of design through floriculture and horticulture. During the Thanksgiving/Christmas season, the New York Botanical Garden’s Train Show in its greenhouse features model trains running through a “landscape” all made of plants. At the Staten Island Botanical Garden, designers from China have created a “Scholars’ Garden” for meditation. The Queens Botanical Garden has a special wedding garden with chosen plants that relate to this celebration. At the Brooklyn Botanic Garden, there is a Shakespeare Garden featuring all the plants mentioned in his plays.

Many other Floriculturists are employed in retail nurseries, garden centers or small flower shops located in many neighborhoods. They work directly with customers who are purchasing flowers or other plants for their own homes or gardens. Most of the plants are in pots or large containers and all of these must be carefully tended as part of the job. Floriculturists working in centers or shops often have special training in floral design, which can be learned on-the-job or by taking certificate lessons at botanical gardens. They prepare bouquets or wreaths that people need for special occasions, such as weddings, graduations or memorial services. Often, they are advising on purchases of flowers for customers to take home and arrange themselves. This career is one that offers many types of jobs for those with high school diplomas or with additional training.

Floriculture
Gardeners love working directly in the soil and creating spaces for beautiful flowers or other plants. Even in our urban environment, almost everyone can be a Gardener, even if it’s only in a small backyard or courtyard or in containers on a fire escape.

Those who choose a career as a Gardener or Horticulturist often work for the Parks Department in parks across the city. Some work for the Housing Authority or for private developers, helping create gardens around the City’s many large buildings. Many others work in botanical gardens in all five boroughs. Some work for private companies or for organizations that sponsor community gardens.

Horticulturists work on a year-round schedule that follows the seasons. In early spring, they remove mulch and other materials that have covered the planting area and begin turning the soil to make the beds ready for seeds or for plants that are moved from greenhouses or other indoor spaces. Some plants may have been “over-wintered” indoors in containers or Horticulturists may propagate new plants through cuttings and grafting. Under the soil may be bulbs or roots of flowers or vegetables that are ready to grow in the new season. The bulbs may have been planted a long time ago and will grow year after year or they may have been planted in the previous fall.

As plants grow, Horticulturists must tend to them regularly, especially by watering. Very few plants can thrive if they do not receive the right amount of water, either through good rainfall or by special “soaker” hoses or by hand. As Horticulturists know, some plants survive very well with little water, but many others need a great deal, even several times a week. They also prune the plants at specific times that help them grow better over time.

During the winter, Horticulturists focus on plants that grow indoors, in pots or planters or in specially prepared areas in greenhouses. Their work with Floriculturists through the winter helps to create special exhibits at holiday time, or provide ongoing green beauty when the outdoor landscape is in its dormancy.

Landscape Architects combine art, mapping and knowledge about plants to create designs for new spaces in the urban environment. Or they may re-design spaces where the use of the land will be changed. They often work closely with Urban Foresters and Soil Scientists as large city projects are prepared.

Landscape Architects also team with builders who are planning large office buildings or apartment houses and with those who want to build or renovate a family home. After the buildings are erected, they create the design for new trees, shrubs and flowers that will surround the outside. Builders and home-owners help with the design as it is prepared.

Landscape Architects then order the trees, shrubs and flowers and supervise the planting of what has been chosen. They work closely with Arborists in this part of their jobs. They help to create green infrastructure that respects the environment and helps to improve it.

Community gardens are also sites for the work of Landscape Architects. As community activists adopt un-used and neglected lots in their neighborhoods, they often need professional advice in planning what should be designed and planted.
New York City is surrounded by water: the Atlantic Ocean, Jamaica Bay and many other inlets, the Upper and Lower Harbor, the East River and Harlem River (not true rivers, but bodies of connecting water), Long Island Sound and, of course, the mighty Hudson River. All these waters are salty or brackish, which is a combination of salt and fresh water. The exception is the fresh-water Bronx River, flowing south through the Bronx to the Sound.

With this huge marine resource, many environmental careers are possible, including Marine Science Biologist or Ecologist, based on biology and zoology, Marine Geologist, exploring the effects on the water from the earth under the bottom, and Marine Conservationist, whose work focuses on the protection of the water environment and its vast wildlife. All of these careers demand extensive work beyond high school, with the focus on science and math.

Many other careers, such as those in Architecture, Archeology, Hydrology and Professional Engineering, can also focus on the marine environment. These careers, which require higher education, also connect to part of a much larger group of jobs that don’t always demand many years of in-school study. Many of these are “learn on the job” careers, such as Deckhands or Engineers on all sorts of harbor boats, Captains or “Skippers” who guide vessels both large and small, and Technical Specialists, who are trained in special skills such as Diving or Marine Rescue. And, as you know from watching the news on TV, many heroic rescues are necessary in the harbor every year, mainly from specially trained Police or Firefighters.

You have many opportunities to observe all these jobs and more by visiting the hundreds of waterfront piers, which serve both for pleasure boats and for commercial uses. You may go out on one of the many fishing boats yourself, or cruise on the old-fashioned sailing ships at South Street Seaport in Manhattan. One of the best and easiest ways to learn about jobs on boats is to ride the Staten Island Ferry, observing the Pilots on the high bridge and the Crew helping to manage the huge boat.
Weather Forecasting and Climate Change Research

Meteorology and Atmospheric Science

Meteorologists are scientists who study the atmosphere and the effects of major air currents, temperature, wind, rain, and snow around our planet. From ancient times, people have always observed the weather every day and there have been continual efforts to understand and predict it better. Great advances in knowledge have come in the past 200 years with the development of new data and instruments. Research is continuing in every country around the globe.

You may be most familiar with Meteorologists as the weather forecasters on TV or on the radio. The best of these have studied the science in a serious way and have been given the “Seal of Approval” by the American Meteorological Society and the National Weather Association.

However, professional Meteorologists have high-level degrees in science and often work for major governmental agencies such as the National Oceanic and Atmospheric Administration and as researchers in universities and colleges. Private companies also employ Meteorologists and information is often shared. Since local weather and climate are influenced by what happens in many other areas, it is important for Meteorologists to understand the “big picture” around the world.

Weather forecasting by Meteorologists is not only relied upon by all of us as we decide whether or not to take an umbrella when we go out. Farmers and many business people are greatly affected by weather patterns and need correct and long-range information in order to plan their activities. Weather often dictates success or failure.

In New York City and in many other places, there is an increased understanding that climate and weather conditions are changing, which may lead to more frequent storms and flooding. New Yorkers saw these conditions in Hurricane Sandy in the fall of 2013. The work of Meteorologists is becoming ever more important.

learn more online
SEARCH: Meteorology, Atmospheric Science, Climate Science

Ornithology, Zoology and Wildlife Management

Ornithologists and Zoologists are highly trained scientists who focus on researching animals, such as birds and mammals. Their work is part of a long natural history, and is important in the understanding of evolution and ecology. Many of them started as children by closely observing birds, domestic or wild animals or farm animals. Through advanced education, their knowledge and skills have helped them combine their work with that of biologists and ecologists.

Professional Ornithologists and Zoologists use old and new knowledge and technical information to advance their research. The science of observation and study became more professional about 250 years ago, as more people began exploring parts of the world that held thousands of species they had never seen. Swedish scientist Carl Linnaeus developed a system for identifying each bird or animal by its own special name. By the late 19th century, his system was in wide use and many technical aids were also developed.

Most professional Ornithologists and Zoologists work at colleges and universities or at science centers in museums or zoos. Much of their work is outdoors, as Wildlife Managers, tracking wild creatures who, of course, don’t stay in one place. At their work in zoos, they specialize in observation of animals in captivity. They must stay in contact with other scientists, both near and far, to study these populations together. They pay special attention to habitat – the places where birds and other wild animals live.

Many Ornithologists and Zoologists also work for governmental agencies or for large private scientific companies. In addition, there are certain non-profit organizations that provide jobs for Ornithologists or Zoologists. Two that are well-known are the National Audubon Society and the World Wildlife Fund.

Their combined knowledge has been crucial in counting birds and other animals to identify those with such small populations that they are in danger of extinction. We now have the categories of “endangered” or “threatened”, where much care is needed to try to bring back and guarantee a larger population for the future. One success was the saving of the Peregrine falcon – a bird that has found good nesting spots on New York City bridges.

learn more online
SEARCH: Ornithology, Zoology, Wildlife Management
Soil Science Researchers study the soil in which our trees and other plants grow. Their work requires a deep knowledge of science and geology. Soil Science Researchers often work for colleges or universities, but also for governmental agencies or private companies.

Soil is not “dirt”. It’s the all-important surface of the earth that is based on rock, but is slowly changed by the effects of water, air and living and dead organisms. Depending on how it’s created, soil can allow trees and other plants to grow well. But sometimes it may not have the proper mixture to sustain healthy growth.

Soil Science Researchers study the types of soil by conducting surveys that sample soil in the ground, itself, through field studies that often involve digging beds (large, deep holes) in the soil. They look at layers of soil for color, texture, mixture of minerals and location. They study the chemical pH in the soil to see if it is acid or alkaline. They continue their studies in laboratories.

Depending on what they find, Soil Science Researchers may advise others caring for the urban environment to add items to the soil to make it better. This could include organic fertilizer, decaying leaves or plant stems or other once-living matter that will release nutrients that are essential for plant growth. They may advise that caked soils need sand added to break them up. Sometimes, they may advise that certain soils will not support successful growth.

Soil Science Researchers may also test how much water is in the soil or how much water the soil can hold when water is added to it. Some trees, for example, thrive in soil that has a lot of water. Others may die if there is too much water around their roots.

In addition to their field work, Soil Science Researchers need to be good writers because they need to share their findings with others, such as Foresters, Arborists, Gardeners and Farmers, whose work depends on good soils. They often work closely with the community as plans for successful growth are put in place.

To learn more about soil science researcher, search: Soil Science

Solar Energy for the Environment and Economy

Heat energy from the sun has always been a crucial part of life. In modern times, we are learning how to capture it for more specific use, especially in buildings. The development of solar energy is growing and will replace some of the use of fuels such as coal, oil and gas, though they are also expected to continue as part of our country’s energy mix.

Solar Energy is now being planned for use in new construction and in renovations of older buildings. In many cases, the plans call for solar collectors to be put on roofs or near structures and are then connected to electrical energy use or for heating water in water tanks or in furnace boilers for heat. Most of the collection systems are connected to the electrical power grid from large companies that supply electricity. New and growing businesses are being established as solar energy continues to be captured.

To learn more about solar energy producer, search: Solar Energy, Solar Design, Solar Engineering, Environmental Engineering, Entrepreneur

Entrepreneurs are people who decide to create private companies that will offer solar collectors and other hardware for sale to the public as building designs are put in place. They provide the “up-front” money to make establishment of businesses possible. As sales of products develop, they expect their businesses to create profits and survive. Jobs are available in the companies as they develop.

To learn more about electrical engineers, search: Solar Energy, Solar Design, Solar Engineering, Environmental Engineering, Entrepreneur

Electrical, Structural, Mechanical and Environmental Engineers take the designs and turn them into detailed plans for the manufacturing and installation of products such as solar collectors and the systems that transfer the heat energy to uses such as heating water or providing heat for homes and office buildings.

Manufacturers make the products that will capture the heat energy of the sun and transfer it to water heaters and furnaces or boilers. Once the products are available, Salespersons, usually working for Manufacturers or Entrepreneurs, will then offer them for sale to the public for use in constructions.

A wide variety of careers is being developed in this new and growing field.
Urban Foresters work in the urban forests of street and park trees. They look at the “big picture”. They take the lead in how urban forests should be designed and managed to improve the quality of life where people live. They study written information and maps to see where open green spaces and trees already exist and identify new areas that might be planned and planted. They often work for governmental agencies, and also for private companies.

Urban Foresters work outdoors to conduct a tree inventory that tells them exactly where, how many and what kind of trees are already growing on city streets and in other green spaces. To record this information, they use hand-held computers and other technical devices, but at other times it’s plain old pencil and paper. Interested citizens, including students, often help take the inventory.

The information received helps Urban Foresters understand where to plant new trees on streets or in parks or playgrounds. They also are able to identify trees that are dead or diseased and need to be removed. Removals open up spots for new trees to be planted. All this information is added to the information and maps they already have in place.

learn more online

SEARCH: Urban Forestry, City Planning

As Urban Foresters plan their work, they often meet in public meetings to explain their projects to the community and get local advice. Or they visit schools to help students and teachers become part of their projects.

Urban Foresters then work with other Foresters, Arborists and Landscape Architects to select the best trees for the sites and arrange for them to be planted.

Last, but not least, Urban Foresters plan how the newly planted trees will be cared for, especially the need for regular watering and pruning. Citizens are often asked to help with regular watering of newly planted trees.

urban forester

They take the lead in how urban forests should be designed and managed to improve the quality of life where people live.

Helpful Resources

Public High Schools to Consider
 Colleges and Universities
 Governmental Agencies
 Non-profit Organizations
Some of the following high schools have the environment as their focus. Others feature special environmental or natural resources programs as part of a larger school. All are part of the public school system and are open to students from all boroughs. However, some of them require taking a special test to qualify for admission.

### Helpful Resources

#### Public High Schools to Consider

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<tr>
<th>Borough</th>
<th>School Name</th>
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<td>Urban Assembly School for Wildlife Conservation</td>
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<td>Edward R. Murrow High School</td>
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<td>Green School: An Academy for Environmental Careers</td>
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<td></td>
<td>Leon M. Goldstein High School for the Sciences at Kingsborough Community College</td>
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<td>Rachel Carson High School for Coastal Studies</td>
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<td><strong>Manhattan</strong></td>
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<td></td>
<td>Academy of Urban Planning (LEAF of Nature Conservancy)</td>
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<td>Stephen T. Mather Building Arts &amp; Craftsmanship High School</td>
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<td>Staten Island Technical High School</td>
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### Helpful Resources

#### Colleges and Universities

There are colleges and universities in New York State and in the New York City Metropolitan Area that are well-known for programs in the environment and natural resources. Listed is a small selection that you may want to learn more about.

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<th>College Name</th>
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<td>(Adirondack Mountains)</td>
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<tr>
<td><strong>State College, PA</strong></td>
<td>Penn State University</td>
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<tr>
<td><strong>Stony Brook, NY</strong></td>
<td>State University of New York (SUNY)</td>
</tr>
<tr>
<td><strong>Syracuse, NY</strong></td>
<td>SUNY College of Environmental Science and Forestry at Syracuse University</td>
</tr>
</tbody>
</table>
The following governmental agencies and nonprofit organizations can be helpful to high school students in their studies. Their websites will direct you to their own information and provide other sites for exploration.

These agencies and organizations oversee major outdoor and indoor facilities that you may visit for more learning or for enjoyment. These include parks and outdoor installations in all boroughs, as well as botanical gardens and other sites. They also sponsor programs and projects that you may join.

Governmental agencies and nonprofit organizations also provide internships during the school year or during the summer, though the numbers may be limited. In some cases, there will be a small stipend. Most of the internships will be able to offer you credit toward a high school diploma or provide useful information for college applications.

All those on the list may be best accessed by searching their websites on the Internet.

### Helpful Resources

#### Governmental Agencies and Non-profit Organizations

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#### GOVERNMENTAL AGENCIES

<table>
<thead>
<tr>
<th>City Agencies</th>
<th>New York City Department of Parks &amp; Recreation</th>
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<tbody>
<tr>
<td>State Agencies</td>
<td>New York State Department of Environmental Conservation</td>
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<tr>
<td>Federal Agencies</td>
<td>United States Environmental Protection Agency</td>
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<td></td>
<td>US Department of Agriculture/Forest Service</td>
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<td>US Department of the Interior/Parks Service</td>
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#### NON-PROFIT ORGANIZATIONS

<table>
<thead>
<tr>
<th>Bronx</th>
<th>Bronx River Alliance</th>
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<tbody>
<tr>
<td></td>
<td>New York Botanical Garden</td>
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<tr>
<td></td>
<td>New York Wildlife Conservation Society (Bronx Zoo)</td>
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<td></td>
<td>Sustainable South Bronx</td>
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<tr>
<td>Brooklyn</td>
<td>Brooklyn Botanic Garden</td>
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<td></td>
<td>Gowanus Canal Conservancy</td>
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<td></td>
<td>Magnolia Tree Earth Center of Bedford-Stuyvesant</td>
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<td></td>
<td>Prospect Park Alliance</td>
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<tr>
<td>Queens</td>
<td>Alley Pond Environmental Center</td>
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<td></td>
<td>New York Museum of Science</td>
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<tr>
<td></td>
<td>Queens Botanical Garden</td>
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<tr>
<td>Manhattan</td>
<td>American Museum of Natural History</td>
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<td></td>
<td>Central Park Conservancy</td>
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<td></td>
<td>Cornell University Cooperative Extension - NYC</td>
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<td>Green Guerillas</td>
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<td>GrowNYC</td>
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<td>Horticultural Society of New York</td>
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<td></td>
<td>Lower East Side Ecology Center</td>
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<td>New York City Audubon</td>
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<td>New York Restoration Project</td>
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<td>Trees New York</td>
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<tr>
<td>Staten Island</td>
<td>Greenbelt Nature Center</td>
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<tr>
<td></td>
<td>Staten Island Botanical Garden at Snug Harbor</td>
</tr>
<tr>
<td></td>
<td>Staten Island Science Museum</td>
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