KEY POINTS FOR A “LAMONT FOREST ECO-HIKE”

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- Based on walks originally provided by Dr. Neil Pederson of the Tree Ring Lab, who completed his doctorate in July and is now at Eastern Kentucky University. Modified by the Earth2Class program for the 2005 Open House. Additional information for the 2006 Open House provided by John Sakulich and Sarah Butler of the TRL. Updated by MJP for Open House 2014.

- Area was originally part of the Eastern Deciduous Forest that covered much of Eastern North America before the arrival of the Europeans. This forest came about through ecological succession that began with the melting back of the Pleistocene ice sheets at the end of the last Ice Age, about 10,000 years ago. Bare rocks exposed as the ice melted were first covered with pioneering lichens and mosses, then tundra vegetation (such as is found in the polar regions today). Later, taiga (“ti-ga”) communities developed. These were mostly conifers, such as pine. As climate continued to warm, the deciduous trees became dominant.

- We haven’t been able to learn too much about the site’s 17th – 19th century history. Because it is hilly and rocky, it would not have been desirable for farming. But presumably, like much of the region, the primeval forest trees growing in what became the campus was probably timbered for firewood in the 18th or 19th centuries. They were cut down, thrown over the cliffs, then floated down the Hudson in huge log rafts, cut up, and carried by wagon to homes and businesses in Manhattan and other parts of NYC.

  By the middle of the 19th century, canals crossing NJ brought Pennsylvania coal to the NYC area, reducing the need for firewood. The forests began to regrow, with many light-tolerant species replacing the shade-tolerant species of the original forest. What we see today is really the “second growth” forest of the past century or so.

- In 1929, Thomas W. Lamont (1870-1948), a Wall Street banker, constructed a weekend residence overlooking the Hudson River in Palisades, New York. He named the estate “Torrey Cliff” after John Torrey, a prominent botanist who had spent summers on the site from about 1854 to 1865 collecting plants. More about Torrey is provided in appendix 1.
After Lamont died, his widow, Florence Corliss Lamont (1873-1952), an alumna of Columbia University, donated the estate to Columbia. She wrote, in part, “I am giving the property in my husband’s memory. My gift is unrestricted.” But she was pleased with the University’s plans to make the property a center of geological research, and assured that “the world [would] benefit.”

START BY EDGE OF ROADWAY NEAR GEOSCIENCE BUILDING
Please use the walking sticks, especially on the rougher sections. There’s no obvious sign of poison ivy on the path itself, but lots in places just off the trail. Water bottles should be available.

STOP 1 “WHAT IS DENDROCHRONOLOGY?”

- Studying the past (“chronos” = “time”) with tree rings (“dendro”).

Dendrochronology is the science of obtaining information from tree-rings. Since trees are long-lived organisms and they stay in one place during their lives, trees function as resident historians. The trees record information about the climate and environmental conditions that they experienced in the past.

Dendrochronology was first developed in Arizona by A.E. Douglas in the 1920s. He was investigating links between droughts and sunspots when he realized tree stumps all showed a similar pattern that might be linked to environmental conditions. This opened research about climate change during the past 1,000 – 2,000 years.

More about dendrochronology will be explained at Stop 3

The PALISADES

- Lamont lies atop the Palisades. These rock formations were first observed by Henry Hudson in 1609 as he sailed up the river that was to bear his name during a voyage of exploration for the Dutch east India Company. He saw vertical columns that reminded him of a palisades-type fort, made by digging a trench and putting logs in upright to create a high wall.

- Geological studies found that these rocks were intruded through flat-lying sedimentary layers as the Atlantic Ocean began to open, about 195 million years ago. Later, uplift and tilting raised them above sea level. Erosion wore away the overlying sandstones and shales, which can still be found to west in Rockland County, Bergen County, and other nearby areas.
• The Palisades are composed of a dark igneous rock related to basalt called “diabase.” It was quarried extensively in the 19th century, but citizens wishing to preserve the beauty of the region pushed the NY and NJ legislatives to establish the Palisades Interstate Park at the turn of the last century. There are still some well-run quarries on the western edge of the Palisades, one opposite Palisades Mall on the north side of the NYS Thruway.

• The Hudson River once flowed through a weak zone in the Palisades, carving out the Sparkill Gap. The Route 9W viaduct crosses this about 2 miles north of Lamont. The river flowed for millions of years westward and southerly, eroding what became Rockland, the Hackensack Meadowlands, and much of northern NJ. It eventually empties into the Hudson where the Raritan now flows. A small stream at the base of the Palisades slowly eroded northward, and when it broke through, the river changed its course and flowed more directly southward, carving out its current route.

Glaciers during the last ice age provided the final shaping to the river and the surrounding regions.

STOP 2 “WHAT ARE SOME OF THE TREES WE CAN SEE HERE?”

• The forest surrounding LDEO is located in a zone of transition between two biomes, or ecoregions. Species that are typical of the Hemlock-Northern Hardwoods region to the north, and species characteristic of the Oak-Hickory region to the south can be found here. This results in more species diversity here than forests to the north and south. Some trees typical of the northern region include eastern hemlock, sugar maple, and American beech. Species typical of the southern region include yellow poplar (tulip tree), sweetgum, pignut hickory and shagbark hickory.

Many of the dead trees at this location and elsewhere in the nearby forest are hemlocks. In addition to a warming trend that favors the more southern species, there is evidence of biological causes (insect or viral) that contribute to the die-off. Tree Ring Lab scientists are starting to look at this through a series of selected 100 m x 100 m plots and transects (surveys along specific lines.)

Questions to consider here:

What factors influence the distribution of tree species?
What can the past and present range extents of tree species tell us about climate change?

• In addition to the native species that typify the northern and southern ecoregions, there are many “exotic” (non-native) species that can be
found here. The campus lies relatively close to the Port of NY and NJ and the Hudson River. Ships from all over the world may contain seeds, insects, fungi, and other organisms hidden in cargo or bilge water. If these invasive species escape into the wild, they may have few of no predators, and can spread rapidly.

- Trees such as Norway maple and tree-of-heaven are species that have been brought to North America from their native habitats in Europe and Asia. Humans originally brought these species here as ornamental trees for gardens, but the trees escaped cultivation and have become invasive species that compete with native species for resources (light, water, soil nutrients, and space). Many invasive species are very successful in out-competing native species, leading to reduction in the diversity of plant life in a region.

Question to consider here:
*What are some characteristics that might help a plant out-compete its neighbors for resources?*

**STOP 3 – SOUTHERN AND NORTHERN BIOMES**

- The campus and other locations nearby in the Hudson Valley lie near the ever-shifting boundary between trees that are commonly found farther south and trees that are commonly found farther north.

Northern species—sugar maple, eastern hemlock, yellow birch, and American beech

South species—pignut hickory, sweet gum, tulip tree, scarlet oak

- Expansion or contraction of the range limits help scientists monitor climate alterations. Sweet gum is at its northern limit not far north of Lamont. If it continues to expand northward, it might be a result of climate warming.

- Snowpack is another factor that varies geographically. The amount and duration of winter snowpack affects root freeze, which can stunt growth and affects tree ring width. The relatively short snowpack season in the lower Hudson Valley, compared with, say, the Adirondacks, may have a negative effect on tree growth.

**IMPORTANCE OF DEAD TREES**

- When a tree dies, it leaves a gap in the forest that can be taken over by non-native species. Examples here include Chinese tree-of-heaven
and wineberry. So in a decade or two, the forest may have quite different species than now. (More at Stop 3.)

- Dead trees provide many resources to forest organisms. Carbon and other nutrients are slowly released into the environment. These increase the organic matter, which improves the soil water holding capacity and soil quality. It may take decades for a large tree to decompose entirely.

VINES

- If possible, discuss some of the ecological behaviors exhibited by vines and other plants.

STOP 4 “WHAT DO TREES TELL US ABOUT EASTERN NORTH AMERICA’S CLIMATE HISTORY?”

Studying species and ages of dead trees through dendrochronology can reveal much about changes in a locality.

- Arizona dendrochronologists at first did not believer that the technique could be used in the eastern forests, where the variations in precipitation from month to month are not as drastic. We receive about 10 – 15 cm each month, compared with the distinct wet and dry seasons in the desert southwest.

- In the 1970s, Ed Cook and Gordon Jacoby of the Lamont TRL demonstrated that trees growing on steep slopes and outcrops live in conditions with lower soil water and are thus dependent on the rainfall. Their variations can be used as sensitive indicators of climate change.

- Some of their first studies came soon after a severe drought in the 1960s, which was clearly reflected in the tree rings. However, as they extended their investigations back by using older trees, hey fond a drought pattern dating back into the 1600s, with some droughts lasting for decades, not just a few years.

INVASIVE SPECIES

- Introduced species often get a foothold in our area due to its close proximity to international ports like New York, Philadelphia, and Baltimore. For example, tree-of-heaven was originally brought to Philadelphia as a garden tree in 1784. Also, the American chestnut blight, a fungus that led to the extinction of the American chestnut, is believed to have arrived in lumber shipped to New York from Asia at the turn of the 20th century. [See map below]
Tree-of heaven is a very successful invasive species. It produces many seeds per tree (around 300,000 – 400,000!), the seeds have a high percentage of successful germination, the trees can also re-sprout from stumps or roots when cut down, and the trees produce chemicals in their roots that are toxic to the roots of other plants (allelopathy).

Some introduced (invasive) species are not plants, but organisms that cause plant disease like insects, fungi, bacteria, or viruses. Many plant diseases have been introduced to our area from Europe and Asia. Some examples include the hemlock woolly adelgid beetle, and Dutch elm disease (a fungus). Why are these pathogens so devastating to our native species, but do not produce the same effect on trees in their original habitats (Europe, Asia)?
STOP 5 “WHAT CAN DENDROCHRONOLOGY TELL US ABOUT HUMAN INFLUENCES IN THIS REGION?”

- Part of the Lamont campus probably was included in “Skunk Hollow,” a 19th century community founded by descendents of free Blacks from Manhattan, former slaves, and two Black landowners who were among Tappan’s original settlers. There are some cellar holes and other evidence of this community. Many of its inhabitants were eventually able to move into Sparkill and other communities.

- You can see in places on the Lamont and surrounding areas the stone walls constructed by residents of Skunk Hollow and other early farmers in the Northeast. This was a way to clear the potential fields of stones that would damage plows, and construct boundary markers among properties. The stones were left in the glacial till. American poet Robert Frost commemorated these in his “Mending Wall.” It concludes with the famous line, “Good walls make good neighbors.”

- The size of some trees led some researchers to claim that the area was an “old growth” forest. But coring for tree rings revealed that these were only well-nourished trees and only a century or so old. When one of the old trees die, the smaller and younger trees may have more sun available, and undergo a growth spurt that can be revealed in the tree rings.

- One of the earliest mansions built by the Europeans settlers in this area is the “Palisades big House.” It was long thought to have been constructed in the 1690s, but TRL analysis of the wood used in its flooring proved that is was built around 1738.

For more information about the Palisades Interstate Park and the Long Path, see Appendix 2.
Appendix 1 – John Torrey biography (by “Jennifer M”)

http://pss.uvm.edu/ppp/torrey.html

John Torrey was born on August 15, 1796, in New York. During his childhood, Torrey spent his leisure time collecting plants and flowers around his home in New York. When he was fifteen years old, his father was selected Fiscal Agent of the State Prison of New York. This is where he met a man named Amos Eaten, an established educator in the natural sciences, who encouraged Torrey’s interest in chemistry and mineralogy.

In 1817, Torrey was appointed to collaborate on the "Catalogue of the Plants Growing Within Thirty Miles of New York." A year later he received his medical degree and opened a practice in New York, while still spending his spare time in the field of botany. In 1824, Torrey was Assistant-Surgeon at West Point and also took the position as a Professor in Chemistry, Mineralogy, and Geology. He quickly moved up to the top to the Chairperson of the Chemistry and Botany College in New York.

In time, Torrey became frustrated with the Linnean system and wrote a compendium using John Lindley's modern natural system in where plants were categorized by families. Torrey later applied this system to a large work: A Compendium of the Flora of the Northern and Middle States. “In 1831, Torrey supervised the publication of an American reprint of the first edition of Lindley's Introduction to the Natural System of Botany, and appended a catalogue of the North American genera arranged according to it. Torrey was appointed New York State Botanist in 1836 and consequently compiled the flora of the state, which was published in 1843 and largest single work of its time.

Torrey broadened his research to the Great Plains and the western Rocky Mountains. He also collected and identified plants along the Pacific Railroad routes, Mexican border, and the plants collected on the expeditions of Stephen Long, Joseph Nicollet, John Fremont, William Emory, L. Sitgreaves, Howard Stansbury, and Randolph Marcy and Charles Wilkes. John Torrey was a member of many scientific societies in America, as well as Europe. He was a twice-elected President of the New York Lyceum of Natural History, a corporate member of the National Academy of Washington. He was a chief pioneer in America botany, a gifted teacher, and also had an unselfish personality. He was also known to become friendly with all who met him.
Appendix 2

Palisades Interstate Park web sites

New Jersey Section http://www.njpalisades.org/

Wikepdia description http://en.wikipedia.org/wiki/Palisades_Interstate_Park


The Long Path

  History http://members.aol.com/howiedash/history.html

  NJ Section http://www.njpalisades.org/longpath.htm

  NY Section http://members.aol.com/howiedash/overview.html