Princeton University Outdoor Action

Sustainability Guide

Outdoor Action

About Outdoor Action

Over the past thirty-five years, Outdoor Action—Princeton University's outdoor education program, which operates as part of the Princeton-Blairstown Center—has become a unique resource at Princeton. Outdoor Action has introduced thousands of entering students to the University and what it means to be a member of a diverse community. We foster this personal growth experience principally through small-group wilderness trips where groups of students, under the supervision of OA leaders, become a community—self-reliant yet interdependent. We stress values of communication, respect for others, caring for the environment, and service. The impact of the Outdoor Action Program on the Princeton campus is extensive. Over half of all currently enrolled undergraduates have participated in some Outdoor Action activity. Since the program began in 1974 over 60,000 students have participated in the program, some repeatedly.

A critical part of Outdoor Action is the Leader Training Program since almost all Outdoor Action activities are led by student leaders. Each year, 80 to 100 students participate in an extensive leadership development program that trains them how to effectively lead other students in the outdoors and how to facilitate team building and positive group interaction. In addition to the valuable work that they do for Outdoor Action, these students utilize their leadership abilities in many other positions on campus. Many find that their OA leadership experience is one of the most important parts of their experience at Princeton.

Special thank you to the High Meadows Foundation for making this effort possible.

This guide is printed on 100% post-consumer recycled content paper.

Outdoor Action

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Outdoor Action's Commitment to Sustainability

The Outdoor Action Frosh Trip program is a Princeton University orientation program that gives incoming freshmen the opportunity to start college on a six-day backpacking trip with their future friends and peers. Outdoor Action has always been aware of its unique opportunity to influence Princeton's students, since it is responsible for giving more than half of each incoming class one of its first Princeton experiences. For this reason, Outdoor Action provides an ideal situation not only for students to make friends and start settling into college, but also to discuss issues that will invariably crop up over the next four years, such as alcohol and diversity. Outdoor Action also provides a unique opportunity for learning about sustainability, since the experience of living in the backcountry naturally encourages students to be mindful of their impact on the environment. We hope to give students not only a memorable Frosh Trip experience, but also a new perspective on their relationship with the environment that will stay with them long after they've returned to Princeton.

Starting with the planning and research that took place in summer 2008 with support from the High Meadows Foundation, Outdoor Action has launched a new initiative to become as sustainable as possible, both on and off the trail. The goals behind this initiative are twofold: first, to evaluate and reduce the program's carbon footprint by reducing packaging, post-trip waste, and the distance our food and gear have to travel in order to reach us; and second, to use the Frosh Trip itself as a way of prompting students to think about the importance and fragility of the environment and their role in present-day environmental issues.

The Purpose of this Guide

The following guide provides background information and educational tools for the Frosh Trip leaders to use in the planning and execution of the Frosh Trips. The guide is broken down into three categories related to sustainability and backcountry travel: Landfullness, developing a relationship with place; Eco-Footprint, a tool for evaluating your environmental impact both on an off the trail; and Leave No Trace and Sustainability, actions that integrate best practices in sustainability with best practices in Leave No Trace outdoor ethics.

We hope that this guide continues to grow and develop with input from Outdoor Action trip leaders, Frosh Trip participants, and outdoor and environmental educators everywhere. We also hope that this guide serves as a catalyst and tool for outdoor organizations around the world to integrate sustainable practices into backcountry travel and to progress the field of outdoor environmental education.

This guide was written by Jessica Kellett. Thank you to Rick Curtis, Eric Cielinski, Emily Sung, Colleen Driscoll, Shana Weber, Jeffrey Domanski, Jeff Hougland, Abby Rowe, Paul Van Horn and Ryan Silva for their input, feedback, and support.

Sample Itinerary

Below is a sample itinerary for integrating sustainability facts, discussions and activities into your trip's schedule. Please adapt the itinerary to meet your trip's pace and activities.

Saturday Evening with Your Group

____ Discuss the sustainable food options on the OA trips while repacking your food.

____ Sort all packaging into recycling and waste and bring it back to the parking garage for disposal.

Sunday

____ Hand out the waste bags. Discuss what type of waste goes into each bag and Outdoor Action's goal to minimize waste on page 27.

____ At some point when you need to stop and purify water, discuss fresh water and bottled water issues on page 8.

____ During a break, share some history about the place you are in. Refer to the Water Gap and Catskills histories on pages 11 and 12 or to the guidebook for your area.

Throughout the week

____ Find "Teachable Moments" to share facts that connect to the natural resources around you and the sustainable practices on the trip while you are interacting with those objects.

____ When possible, connect to actions they can take and resources on campus.

Monday

____ During lunch, the first time you eat the tuna and salmon, point out the decision to include Alaskan Salmon on this year's trips.

____ During a break, identify the trees around you using the Tree Identification guide on page 14.

____ During another break at a location with views of the surrounding terrain, do the watershed activity on page 17.

____ In the afternoon, play "Greatest Impact" on page 22.

Tuesday

____ On the trail, do the "Topo Naming" activity on page 15.

____ In the afternoon, do the "Connecting to Place" activity on page 16.

____ After dinner, read Aldo Leopold's "Marshland Elegy" on page 31.

Wednesday

____ On the trail, calculate your "Eco-footprint on and off the trail" on page 23.

____ After lunch, read the "Tuna vs. Salmon" case study on page 20.

____ At some point, pull out your waste bags. Check to see that waste is going into the correct bags and compare your compost, recycling and landfill waste.

____ In the afternoon, do the "What is sustainable food?" activity on page 29.

Thursday

____ Do the "Rope Mapping" activity on page 15 before the final debrief.

____ Do the "Orange Bandana" activity on page 28 as part of your final debrief. Include an action that students think that they can take on campus to be more sustainable.

Friday

____ Bring your well-organized waste bags to the parking garage to be weighed.

Defining Sustainability

Sustainability is a relatively new term for addressing environmental issues. It was first defined at a 1987 United Nations conference as **"development that meets the needs of the present without compromising the ability of future nations to meet their own needs."** This first definition focused primarily on the use of natural resources. Since then, the term has evolved to also incorporate economic goals and social equity values. Today, sustainability often takes on different definitions depending on the motivation of the presenter and his or her audience. Below are additional definitions of issues related to sustainability that can be used in framing different environmental, economic, and social equity issues:

Natural Capital

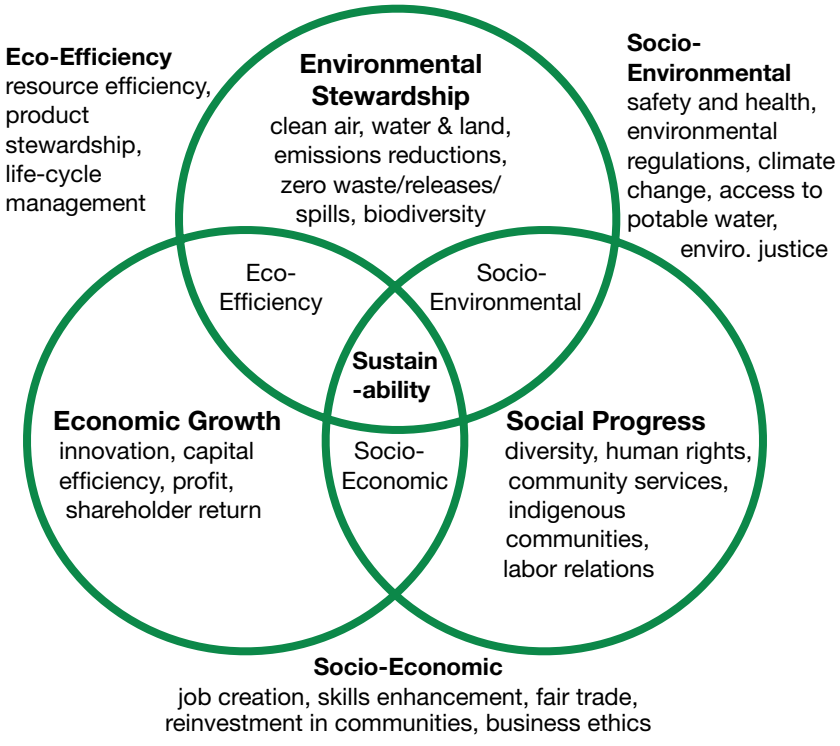
Natural capital places a value on the resources of a natural ecosystem that yields a flow of valuable ecosystem goods and services into the future, such as the ability of a wetland to protect a city from storm surges or the ability of forests to purify air. These ecological benefits are also referred to as ecosystem services. Natural capital also refers to a changing world, wherein resources are limited and the human population is growing. In such a world, it is even more important to limit our use of non-renewable resources and value ecosystem services.

Environmental Justice

Environmental Justice is an evolution of civil rights and human rights issues concerning the inequitable environmental and health burden born by groups such as racial minorities, indigenous communities, and residents of developing nations. Examples of environmental justice issues include the placement of power plants and chemical factories in poor and minority communities - leading to increased rates of severe health problems like asthma and cancer; the lack of grocery stores in low-income communities of color in the U.S. - preventing access to and increasing costs for nutritious foods like fresh fruits and vegetables; and industrialized nations inexpensively dumping electronic waste like personal computers on developing nations - without regulations, these dumps leak lead, mercury, arsenic, cadmium, beryllium, and other toxins into the ground and waterways.

Triple Bottom Line

The triple bottom line allows for an expanded set of criteria for measuring organizational and societal success. In practical terms, triple bottom line accounting means expanding the traditional reporting framework to take into account environmental and social performance in addition to financial performance. In business, this is often referred to as Corporate Social Responsibility.



Princeton University's Sustainability Plan

Princeton University, with its 380-acre main campus, more than 160 buildings, approximately 7,100 students, and 5,400 employees, has a significant environmental imprint. The University has a history of adhering to high environmental standards in its operations, in offices ranging from facilities and dining services to purchasing, and it continues to move forward as a model for advanced sustainability practices and as a laboratory for students and faculty to test new ideas. In February 2008, the University released a comprehensive "Sustainability Plan," which includes specific goals for reducing the University's carbon footprint, improving resource conservation, and increasing education and civic engagement.

Sustainability Goal

Princeton University's goal is to reduce campus greenhouse gas emissions to 1990 levels by 2020.

What You Already See on Campus

- Princeton has one of the nation's most efficient central power facilities, utilizing co-generation to provide most of the campus' heating and cooling needs as well at 50% of its electrical demand. Still, campus electricity, heating, and cooling account for 85% of the University's emissions. Students' efforts to turn off the lights, use energy management settings on computers, unplug battery chargers (which draw power when not in use), and take shorter showers can greatly reduce the campus footprint.
- All paper used on campus is 100% recycled. Remember to print only when necessary.
- At least 20% of the food served in campus dining halls comes from sustainable local sources, including all of the chicken and many fruits and vegetables. Food waste from the dining halls is sent to a pig farm in Pennsylvania instead of the landfill. As well, almost all of the plastic products in the dining halls and the Frist Campus Center are made from biodegradable corn-based plastic.
- The new Butler College will feature green roofs that reduce heating and cooling costs. The roofs, which are covered in living plant material, will also act as a research site for increasing our knowledge of green roofs and their benefits.
- Low-flow shower heads are installed in 80% of campus showers, and 95% by 2009. These fixtures use half as much water, but retain the same pressure as high-flow fixtures.
- The student organization Greening Princeton hosts a farmer's market on campus during the fall and spring. It's a great place to grab lunch, buy fresh local vegetables, and enjoy the sunshine.

Student Efforts - How to get involved!

Eco-Reps: dorm and eating club representatives
Greening Princeton: works on campus sustainability issues
Princeton Water Watch: monitor and maintain campus watershed
Student Environmental Communication Network: produce media on environmental issues
SURGE: improves academic connection to global environmental issues

Office of Sustainability

The Office of Sustainability coordinates and advocates sustainability efforts in university, regional, and national affairs through collaboration with students, faculty, staff, and administrators. The Office works in close collaboration with the Princeton Sustainability Committee (PSC) to continue developing Princeton's leadership in sustainability.

Focus: Fresh Water

"Suddenly it is so clear: the world is running out of fresh water."

- Blue Gold, by Maude Barlow

In elementary school, we are taught that fresh water is part of a cycle, constantly replenishing itself through the process of evaporation and filtration. Today, we know that fresh water supplies around the world are being threatened by development, pollution and climate change.

There are two types of fresh water, surface water that runs through streams, rivers and lakes and ground water that creates underground reservoirs, called aquifers, in the gaps between rocks under the surface of the Earth. Impermeable surfaces like concrete prevent surface water from infiltrating and replenishing groundwater supplies, and they allow pollutants like oil, silt and soap to run directly into water supplies, like lakes and oceans. Many rivers, lakes and aquifers are being drawn from for irrigation and municipal water use faster than the sources can replenish themselves from rainwater and snow melt. The most notable depletions are occurring at the Colorado River, which supplies water to 25 million Americans in seven southwestern states, but no longer reaches the Gulf of California in Mexico throughout the year, and at the largest aquifer in the U.S., the Ogallala, which runs under the great plains region and supplies 30% of the the nation's groundwater for irrigation. The Ogallala is being drawn from at a rate of 18 Colorado Rivers per year and is estimated to dry up in 25 years.

Climate change will have a significant impact on fresh water supplies around the world. While some areas will receive increased precipitation due to changing weather patterns, many heavily-populated areas will likely be affected by decreased precipitation. One of the most profound effects of climate change on water supply is that weather will become more variable and more intense, resulting in both bigger storms that overwhelm water systems, causing flooding, and in longer, more intense droughts and heat waves that stress already limited water supplies around the world.

Bottled Water

Americans have increased their consumption of bottled water drastically in the last decade, a six-fold increase between 1997 and 2004, in part because they think that it is somehow safer or better than tap water. They collectively spend hundreds of thousands of dollars more per gallon for water in plastic bottles than they would for water flowing from their taps.

In reality, bottled water generally is no cleaner, safer, or healthier than tap water. The federal government requires far more rigorous and frequent safety testing and monitoring of municipal drinking water.

The production of bottled water carries a heavy cost in environmental problems, public health, and social equity. For every liter of bottled water produced, two additional liters of water and 1/4 liter of oil are used; transporting bottled water hundreds and thousands of miles around the world emits CO2 emissions causing climate change; and of 60 million plastic bottles thrown away daily, only 14% are recycled. Recent studies are finding that bottled water production produces Biphenol-A, Phthalates and bromate, which are cancer-causing and hormone-disrupting toxins. Finally, bottled water must come from a source, and, increasingly, beverage companies are privatizing community water supplies around the world, often paying lower costs per gallon of water than local residents while targeting many of the world's remaining healthy aquifers.

Focus: Climate Change

"The atmosphere is the key symbol of global interdependence."

-Margaret Mead

For the past 200 years, the burning of fossil fuels (coal, oil and natural gas), livestock production, and deforestation have caused the concentrations of heat-trapping "greenhouse gases," most significantly carbon dioxide and methane, to increase in our atmosphere. 70% of these increases occurred in the decades since 1970. These gases prevent heat from escaping to space, somewhat like the glass panels of a greenhouse.

According to NOAA and NASA data, the Earth's average surface temperature has increased by about 1.2 to 1.4° F in the last 100 years. Eleven of the hottest twelve years on record since 1850 occurred between 1995 and 2006, with the warmest year being 2006. If greenhouse gases continue to increase, models predict that the average temperature at the Earth's surface could increase from 3.2 to 7.2° F above the average 1980-1999 levels by the end of this century.

Scientists are certain that human activities are changing the composition of the atmosphere and that increasing the concentration of greenhouse gases will change the planet's climate and biosphere - and accordingly affect humans. Scientists continue to study how much it will change, at what rate it will change, and what the exact effects will be. Many models' predictions have already been surpassed, such as the rate of arctic ice melt.

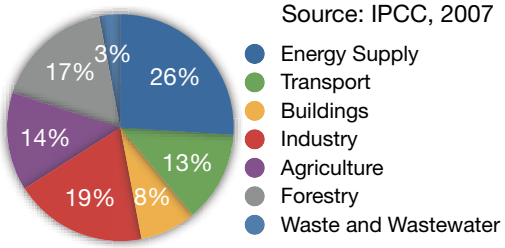
Did You Know?

Princeton University is one of the leading research centers in the world for climate change science and policy solutions. Eleven faculty members were involved in the Intergovernmental Panel on Climate Change that was awarded the 2007 Nobel Peace Price with Vice President Al Gore.

For example, professors Steve Pacala and Rob Socolow are developing "stabilization wedges" that show us how we can achieve significant reductions in greenhouse gas emissions globally over the next 50 years using currently available technologies like renewable energy, fuel-efficient cars and carbon-capture.

Global Greenhouse Gas Emissions, 2004

Source: IPCC, 2007



In order to mitigate significant changes to the earth's climate and biosphere, scientists believe that we need to decrease greenhouse gas emissions to 50-85% below 2000 levels by 2050. Because the rate of greenhouse gas emissions continues to increase annually, it is important to begin stabilizing and reducing greenhouse gas emissions immediately.

Climate change stands to have profound effects around the world due to increasing temperatures, sea level rise, increasing carbon dioxide levels in the air and oceans, and changes in rainfall and weather patterns. Below are a few examples of the current and potential effects of climate change.

- Since 1880, the duration of heat waves in Europe has doubled and the number of unusually hot days has tripled. The 2003 European heat wave killed 35,000 people.
- The U.S. fire season has increased by 78 days in the last 20 years, tied closely to increasing temperatures and earlier snow-melt.
- Increased carbon dioxide levels in the oceans increase acidity levels, which is expected to prevent corals from forming. Significant loss of marine biodiversity at the Great Barrier Reef is projected by 2020.
- In Africa, by 2020, between 75 and 250 million people are projected to be exposed to increased water stress due to climate change. Some regions are projected to receive 50% less rainfall.

Landfullness

Developing A Sense of Place

Think about a place that special memories for you. What made it special? It may have been a beautiful sunset, a celebration with family, or a first time experience. People's connections to place come from a multitude of personal and cultural values and experiences, including but not limited to a connection to nature. The concept of "landfullness" is to create an experience where the *land* - the physical environment you are in and its natural resources - plays an integral role in a student's backcountry experience, as opposed to being a scenic backdrop for developing technical and social skills.

Aldo Leopolod noted, "The problem, then, is how to bring about a striving for harmony with *land* among a people many of whom have forgotten there is any such thing as *land*, among whom education and culture have become almost synonymous with landlessness." In order to overcome people's disconnection from the *land*, landfullness necessitates that we move beyond first impressions – the environment's direct impact on backcountry travel and living – and experience it from multiple perspectives. Students' awareness of and interactions with their environment should encompass the *land* in its entirety: its geology and ecology; its look, feel, taste and smell; its natural history; the people, including ourselves, who have been and will be a part of the land; and finally, the student's relationship to the *land*. By highlighting the natural and cultural history of a place and connecting to its current natural resources and uses, we double the likelihood of making the *land* come alive.

Connecting Landfullness on the Trail to Home and the Globe

As mentioned above, environmental awareness does not flow inherently from a sense of place, but instead through a connection to *land*. Likewise, just because people develop a close connection to the environment and its conservation around one place does not necessitate that they will practice a set of values that promote environmental protection in another (though it does help). For example, just because someone picks up trash around a campsite doesn't mean that he or she will pick up trash on campus.

The best way to create relevance for the "*land* awareness" developed during the trip is to connect the *land* on the trail to the *land* at home and around the world. How do the natural resources we see and use on the trail compare and relate to the natural resources we see and use at home? Where do these resources come from? How are we connected to wilderness areas around the world (for example: clean air, biodiversity, clean water, beauty, sustainable resource extraction)? By building the connections between *land* on the trail, at home, and around the world, we also demonstrate the interconnectedness of nature and the ripple effects of our actions around the world.

Adapted from "Making the Land Come Alive: Teaching from a "Landfull" Perspective," Molly Ames Baker, Colgate University Outdoor Education

The Catskills

Quick Facts

- Region size: 700,000 acres
- Peaks: 98 peaks over 3,000 ft elevation
- Highest point: Slide Mountain, 4,180 ft
- Designation: Land owned by New York state, cities, and private individuals

Wildlife Info

Beaver - once faced extinction from the area due to trapping

Black bear - largest animal found in the Catskills

Bobcat - We can thank this animal for the name the Catskills or "Wildcat Creek" in Dutch

Whitetail deer - This animal is abundant in the Catskills after having been near extinction in the 19th century from year-round hunting

Porcupine - These creatures are plentiful in the Catskills

Conservation History

The conservation history of the Catskills begins with the Eastern hemlock, a native tree that contains an acid used in tanning leather. The industrial revolution brought the installation of many tanneries in the Catskills, as well as acid wood plants, distilleries, factories for furniture and barrels, and many logging companies.

In 1885, the creation of the Forest Preserve saved many of the Catskills' wilderness areas from the industries, even though this organization was primarily created to clean up New York City's water sources. Dozens of towns were then flooded to create reservoirs for New York City's fresh water. In the 1990's a grassroots initiative led by Robert F. Kennedy Jr. added further protections to the 2,000 square miles of Catskills watersheds that supply unfiltered drinking water to nine million New Yorkers. This effort, which cost 1.3 billion dollars, prevented the building of an eight billion dollar water purification facility downstream. Today, New York City owns the reservoirs as well as the land around them, and the New York State Department of Environmental Conservation (DEC) continues to apply strict environmental regulations on the areas within the Catskills preservation.

The DEC has divided the Catskills into four sections: wilderness, wild forest, intensive use, and administrative. The state owns about 40% of the land, with the other 60% being privately owned. Wilderness areas include much of the Slide-Panther Mountain Area, Big Indian-Beaverkill Range, North-Dome West Kill Mountain and Plateau-Indian Head Mountain Range. Human intrusion in these areas – which account for the largest section of the Catskills – is kept to a minimum. In addition to the state and city of New York, the Catskills are preserved by nonprofit organizations, concerned members of the community, and sometimes local townships.

Folklore

Over the years, the Catskill Mountains – and especially the areas near the North and South Lakes – have given rise to much folklore. In particular, the names of certain mountains have interesting histories. For instance, the Big Indian Mountain was reputedly named after an eight-foot-tall Indian named Winnisook. It is said that Winnisook loved and was loved by a white maiden, but that her father did not approve and forbade her from being with him. However, their love was too strong and they ran away together. The father and some villagers went looking for them and killed Winnisook; his body then turned into the mountain Big Indian.

The legend of Rip Van Winkle also takes place in the Catskills. It is rumored that one night while Rip was wandering in the woods, he came across the ghosts of Henry Hudson and his crew. After playing ninepins and drinking a strange liquor, he fell asleep and didn't wake up for twenty years. If while on the Escarpment Trail you come to "Newman's Ledge," look for a low and wooded ridge to the North. Just south of that you should be able to see a valley known as Sleepy Hollow where Rip Van Winkle is said to have wandered.

Delaware Water Gap

Quick Facts

- Park size: 70,000 acres
- Length: 40 miles
- Highest point: Mt. Tammany, 1527 ft
- 8th most visited park in the U.S. National Park system
- Covers a section of the Appalachian Trail
- Frontier in the French and Indian War
- Age of Delaware River: 200 million years
- Designation: National Recreation Area

Wildlife Info

Birds: 260+
Fish: 61
Snakes: 14 (venomous: 2)
Turtles: 8
Freshwater mollusks: 8
Lizards: 2
Mammals: 50+
Number of endangered species: 130

Interesting wildlife to look out for: bald eagles, golden eagles, wild turkeys, black bears, rattlesnakes, copperheads, painted turtles, beavers, otters, ruffed grouses, and prickly pear cacti.

Conservation History

In 1960, the U.S. Army Corps of Engineers finalized a proposal to build a dam across the Delaware River at Tocks Island, just north of the water gap. If it had been completed, it would have been the largest dam project east of the Mississippi that the Corps had undertaken to date. However, the dam was never built, and although the project remained up in the air for the next few decades, it was finally de-authorized by Congress in 1992.

Opposition to the dam project began with the local residents whose land had been reallocated for the dam and surrounding recreation area. The Tocks Island dam would have created a 37 mile long reservoir, requiring the eviction of thousands of people, and the destruction of a number of historical colonial and Native American sites. Furthermore, the plan to create a National Recreation Area added another 47,000 acres to the 23,000 needed for the dam project.

Construction on the dam project was delayed due to severe cost overruns – a result of gross underestimations and budget cuts due to the Vietnam War. This delay swept the project into the path of a national environmental movement that was just beginning to take shape. With the first Earth Day in 1970, the environment finally began to receive widespread attention and political momentum. By the end of the year, a coalition had formed of 50 or more organizations opposing the Delaware Water Gap dam project.

Ultimately, the dam project failed due to a combination of popular opposition, environmental concerns, and cost overruns. After the project was finally de-authorized in 1992, the land around the original reservoir site was retained as a National Recreation Area, and it remains today the eighth-most visited site in the U.S. National Park System.

The Delaware River continues to supply water to 15 million people, 5% of the U.S. population. While the human population in the 330 mile long river basin is larger than the populations of 38 states, the Delaware continues to support a wide array of wildlife, including the largest wintering populations of bald and golden eagles in the East.

About the Gap

A water gap refers to a pass in the mountains where a river runs through. Before the Delaware Water Gap formed, Mt. Minsi and Mt. Tammany formed one continuous ridge - the Kittatinny Ridge, along which the Appalachian Trail runs through the park today. A few million years ago, a river flowing north from Trenton, NJ found a weak point in the ridge and created the gap, then capturing the “flow” of streams to the north and making their water flow south through the gap as it does today.

Animal Tracks

Of the Delaware Water Gap, Black Forest, and Pennsylvania at large

"Those who wish to pet and baby wildlife love them, but those who respect their natures and wish to let them live their natural lives, love them more."

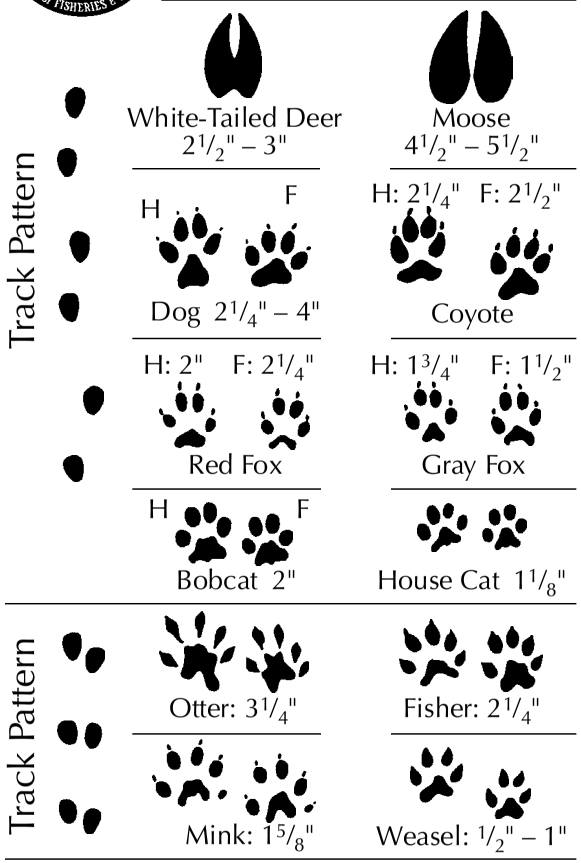
- Edwin Way Teale

Source (opposite page): Guide to Common Trees of Pennsylvania, Cook Forest Online, Cook Forest State Park, http://www.cookforest.com/articles/trees/leaves.cfm

Source (this page): Pocket Guide to MA Animal tracks, Mass Wildlife, Massachusetts Division of Fisheries and Wildlife, http://www.mass.gov/dfwele/dfw/dfwtrax.pdf

MassWildlife

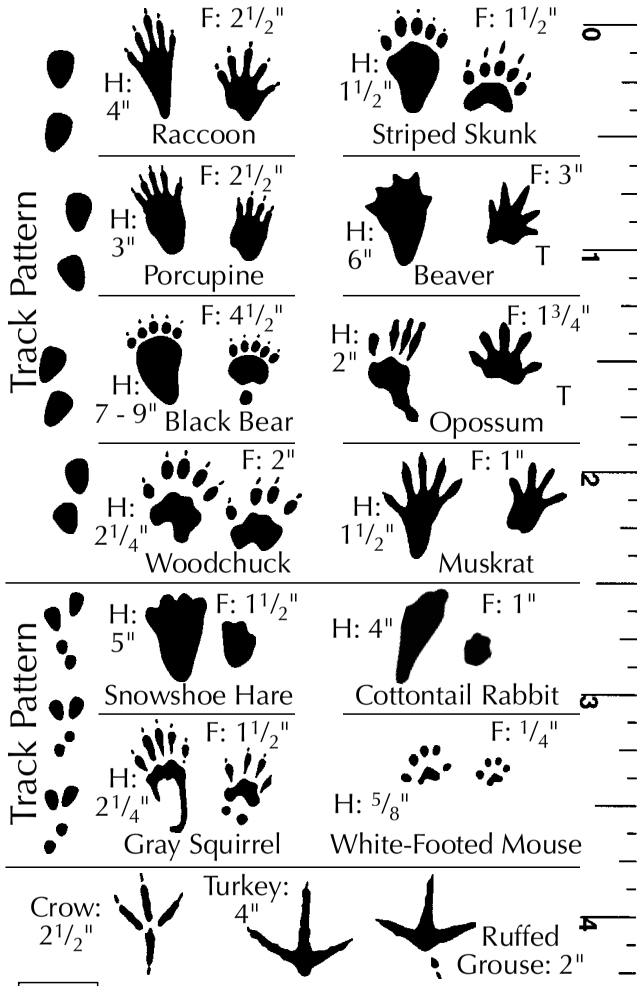
Pocket Guide to MA Animal Tracks



Tracks Not To Scale

Tracks will show considerable variation depending upon conditions of ground (snow, mud, dust, sand, etc.) and movement of animal.

F: Front Track
H: Hind Track
T: Tail marks may be present

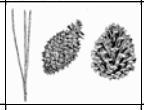
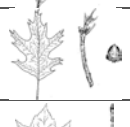
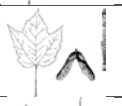
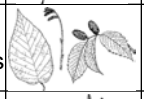
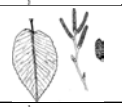
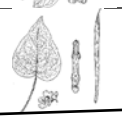


Protect wildlife and its habitat: Support the Wildlands Fund.

Division of Fisheries & Wildlife Field HQ
1 Rabbit Hill Rd.,Westboro, MA 01581
508.792.7270 • **www.masswildlife.org**

Tree Identification

Delaware Water Gap, Black Forest, and Pennsylvania at large

Common name	Scientific name	Picture	Height	Facts
Eastern hemlock	Tsuga canadensis		160 feet	State tree of PA. Uses: construction timber, tannic acid for tanning leather.
Pitch pine	Pinus rigida		40-50 feet	Uses: railroad ties, construction lumber, pulpwood, fuel. Common on poor soils where forest fires have killed most other trees.
White ash	Fraxinus americana		80+ feet	Uses: sporting goods, esp. baseball bats, furniture. Juice from leaves is reputed to relieve mosquito bites.
White oak	Quercus alba		80-100 feet	Traditional uses: hardwood flooring, whiskey barrels, boat building.
Red oak	Quercus rubra		90 feet	Often planted as a shade tree. Uses: furniture, flooring, millwork, railroad ties, veneer.
Red maple	Acer rubrum		50 feet	Also known as soft maple because its wood is softer than the sugar maple.
Sugar maple	Acer saccharum		60-80 feet	Also called rock maple for its hard wood. Uses: furniture, musical instruments, flooring, maple syrup.
Shagbark hickory	Carya ovata		70-80 feet	Heavy, hard wood used for tool handles, fuel wood, & to give a smoked flavor to meats. Archaic uses: bow-wood, wheel spokes for carriages, carts.
Yellow birch	Betula alleghaniensis		60-75 feet	Wood used for furniture, flooring, doors. Bark can be stripped off in emergencies and used as a fire starter, even in wet conditions.
Sweet birch	Betula lenta		50-60 feet	AKA black birch, cherry birch. Uses: furniture, fuel. Distillation of bark & twigs produces oil sold as substituted for wintergreen. Fermented sap used to make birch beer.
American elm	Ulmus americana		80-100 feet	Uses: boxes, barrels, furniture, & reclamation: successfully grown in urban areas affected by air pollution & poor drainage.
American beech	Fagus grandifolia		50-60 feet	Uses: timber. Beechnuts are an important food for wildlife, incl. bears, squirrels, turkeys, grouse. Handsome shade tree for parks & golf courses.
American chestnut	Castanea dentata		80-100 feet	Formerly the most common & valuable tree in PA for its wood & chestnuts. Now reduced to stump sprouts & small trees (~20 feet) due to chestnut blight.
Tulip tree	Liriodendron tulipifera		70-125 feet	Other names: buttonwood, American planetree. Uses: furniture, butcher blocks, flooring. Often planted as a shade tree in urban areas.
Common sassafras	Sassafras albidum		50 feet	Spicy odor. Roots, leaves, & twigs used for medicines & perfumes. Wood used for fuel & fence posts.
Catalpa	Catalpa bignonioides		40-50 feet	Native to the southern U.S. states. Usually planted for shade & flowers. Wood used for posts.

Games and Activities: Landfullness

Teachable Moments

There are many opportunities to discuss the land and its cultural and natural history throughout the trip. The best times to integrate these discussions are during your regular interactions with the objects you want to discuss. For example, discuss the formation of the Delaware Water Gap at a point when you can see Mt. Minsi and Mt. Tammany - or when you have the map out. If you see an animal track, stop, pull out this guide, and ID the animal using the book - you can then point out the other animals that one would expect to find in the region. Discuss fresh water and bottled water issues when you are at a stream filling up your water bottles. Whenever possible, relate the knowledge to environmental facts about Princeton and the University or ask the students to relate the information to their home town.

Here is a simple strategy to use in creating a teachable moment. It comes from Sharing the Joy of Nature by Joseph Cornell, and it is called "flow learning" because the four stages flow into one another smoothly:

1. Awaken Enthusiasm: express your own enthusiasm and interest in a subject
2. Focus Attention: get everyone's attention
3. Direct Experience: allow the group to interact with the subject, share facts
4. Share Inspiration: tell a story, ask the group to share their own examples, etc.

Topo Naming

Rename terrain features on the map based on your personal experiences and/or impressions of the land. This can be done over the course of a day by assigning each student to a section of a trail or river and asking them to create names for the significant terrain features and major junctions that the group encounters. During breaks, you can ask the students who just completed their sections to draw and label the route that they were assigned. Later, pull together all of the maps and compare it to the topo map.

Rope Mapping Activity

On the last full day of the trip, possibly as a lead in to the final debrief, ask the students to draw a map of the route of their trip - which can also include the route they took at Princeton when they arrived on campus on Sunday. Provide the group with rope to create the map, then ask the students to add overlays to it, including personal highlights (for example, blisters, baking cake, etc.), group highlights (for example, seeing a bear, rain, "the best meal") and sense of place landmarks (aspects of the land that were personally significant). Through this activity you and the students will see the journey in place, personal growth and group cohesion that took place over one week.

Connecting to Place

Give out four index-card sized pieces of paper and a pen to each student. Ask the students to write on one side of each piece of paper a place that they identify with and think of as special to them. A “place” could be a city, a vacation spot, or their family’s house, for example. Ask them to write on the back side of each piece of paper what they value about that place in a word or short phrase.

Ask the group to form pairs. Give the group four minutes to share their four places with their partners. Make an announcement at two minutes to switch presenters if they haven’t already done so. After four minutes, form a circle and ask the following questions:

- What was something interesting that you learned about your partner’s places and you’re partner’s connection to those places?
- What makes your places special to you?
- How do you connect to your places?

When you complete the discussion, ask the group to combine their cards and arrange them around a series of topics. First, ask them to arrange the cards from the smallest location to the largest location. Second, ask them to arrange the cards from where they spend the least time to where they spend the most time. Third, ask them to arrange the cards on a spectrum from wilderness to urban. Fourth, ask them to arrange the cards geographically, creating a map of their places. Finally, ask them to flip the cards over and arrange the cards by common values. After the fifth round, flip the cards over to reveal what places shared common values. You can also open up the topics to ones that the students choose.

After each round, ask the students to make observations about the arrangement of the cards/places. When the activity is complete, reform a circle and ask the students the following questions:

- What did you observe about the changes in the arrangements of the cards over the five rounds?
- What did you observe about the relationship of your cards to the others over the five rounds?
- Did you learn anything new about your places - or your perception of them - through this activity?
- What have you observed about this place that makes it special?

The discussion can continue onto broader sustainability topics. Specifically, how do we relate to larger environmental issues and their potential effects - through our favorite places - and what choices are we willing to make to have a positive effect on these environmental problems.

- Have you observed changes to your places over the time that you have known them, both positive and negative? How did those changes affect you? How do these changes affect the natural environment in there places and globally?
- How do you think that your places (and this place) will be affected by the following issues: development/sprawl, climate change, water issues, pollution, and overuse. Are the lifestyle trends and physical changes in these places going to make the impacts easier or more difficult to address?
- What can you do (and what do you do) to have a positive impact or prevent a negative impact on your favorite places?

You are Always in a Watershed...

Cup your hands together. You just created a watershed, which is an area of land that drains downhill to a body of water. Imagine a drop of water landing anywhere on your hand and watch it travel through the crevices to the crease between your hands. The top of your hands are the mountains and hills - the highest points which mark the boundary of your watershed, your fingers and creases are the streams, and the crease between your hands is a river. This is how a watershed functions, and you are always in one. Most waterways eventually flow to the sea, but some are closed, like the Aral Sea.

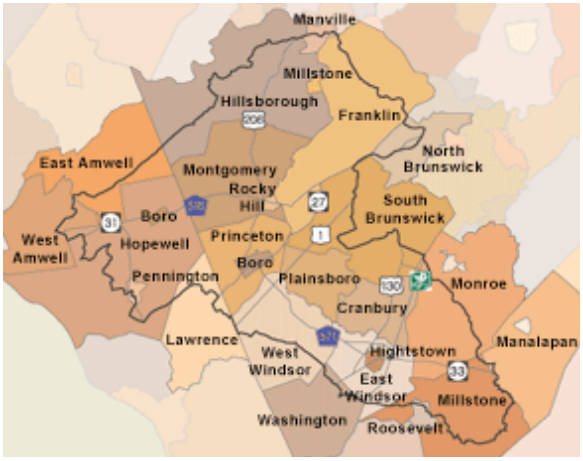
Anything that you do inside a watershed affects the water supply. A drop of oil spilled at the top of the watershed eventually makes its way to the river and the sea. Supporting healthy ecosystems throughout a watershed helps to improve water quality and increase water availability.

Questions for discussion:

- Can we identify aspects of the watershed that we are in right now, such as its boundary, tributaries and the direction of flow? (You may want to do this at the top of a peak or in a open area in order to see the geography around you, or use a topographic map)
- In what ways may we affect the watershed that we are in right now? How can we minimize these impacts? (For example: food waste, human waste, swimming with sunscreen or DEET)
- Do you know your watershed at home? Do you know where your local drinking water comes from? Do you have memories of playing in a local stream, river, lake or ocean at home? Have you witnessed pollution in your local waterways? How did it make you feel?
- Do you know what watershed Princeton University lies in? (See inset below)

Princeton University's Watershed

Princeton University lies in the Stony Brook-Millstone Watershed, which covers 265 square miles, 26 municipalities and 5 counties in central New Jersey. The Stony Brook flows east from the Sourland Mountains through Hopewell and Princeton Township and the Millstone river flows north west from the New Jersey Coastal Plain. At Carnegie Lake, the Upper Millstone and the Stony Brook come together. Below the lake's dam, the lower Millstone continues north - paralleled by the Delaware and Raritan Canal - to its confluence with the Raritan River in Manville. Both the Millstone and the D&R canal supply water to the region. The D&R canal, which originally ran as a barge canal from 1834 to 1932, flows from the Delaware river, connecting the Delaware Bay to the Raritan Bay and New York City. All of the industrial and agricultural pollution that flows into the Delaware river flows downstream into the D&R canal.



Princeton Water Watch, a student organization, monitors the streams that run through the University and works to improve water quality throughout the watershed.

Source: Stony Brook-Millstone Watershed Association, www.thewatershed.org

Eco-Fooprint

What is an Eco-Footprint?

An Ecological Footprint, or eco-footprint, is a tool for measuring an individual's or society's impact on the natural resources of the planet. Specifically, it measures the amount of land and water required to accommodate a particular lifestyle over one year. Usually, the footprint is expressed in "global acres," a standardization of the land and resources on the planet, such as cropland, forest land, built-up land, fisheries, and carbon dioxide. Global acres for one person or one nation can then be multiplied by the number of people on the planet to see how much land and water would be required for everyone to live like they do. This global footprint is often expressed by how many Earths would be required to accommodate the total global acres of everyone consuming at a particular rate. For example, we would need 2.5 planets worth of natural resources if everyone consumed natural resources at the annual rate of an average German.

In a sustainable world, society's demand on nature is in balance with nature's capacity to meet that demand. Currently, the world's eco-footprint is 25% greater than what the planet can actually regenerate. We maintain this overshoot by depleting renewable resources and heavily relying on non-renewable resources - and we are therefore reducing the stock and productivity of global resources while populations continue to grow and develop.

What is a Carbon Footprint?

The carbon footprint is the fastest growing component of the ecological footprint. Carbon footprints are often expressed in metric tons of carbon emitted per year from sources such as electricity production, transportation and livestock production, and it can be applied to individuals, businesses, and communities. In the case of the ecological footprint, carbon is translated into the amount of land that would be necessary to absorb carbon dioxide emissions into living plant material.

Carbon dioxide is the most important anthropogenic greenhouse gas causing climate change, its concentrations in the atmosphere rising by more than 35% in the last 150 years as a result of burning fossil fuels and deforestation - 80% of those emissions occurring after 1970. Fossil fuels - coal, oil and natural gas - are ancient carbon dioxide molecules that were stored as carbohydrates in plants through photosynthesis and then converted over millions of years into hydrocarbons, or fossil fuels. This ancient carbon carbon dioxide is now returning to the atmosphere through the process of burning coal, oil and natural gas, which are non-renewable sources of energy, meaning that the Earth cannot recreate this resource for millions of years, nor can the Earth's biosphere absorb the excess carbon dioxide emissions in the atmosphere. We would have to plant over 28 billion trees to absorb the carbon dioxide released into the atmosphere in 2005 alone! At the same time, we are decreasing the Earth's capacity to absorb carbon dioxide out of the atmosphere through deforestation. All this excess carbon dioxide thickens the blanket of heat-trapping gases in the atmosphere, warming the planet and causing a chain reaction of environmental change around the world.

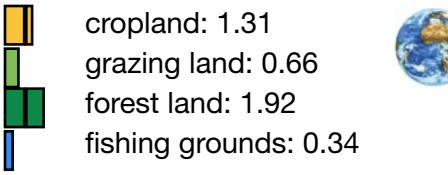
What does a metric ton of CO2 look like?

- ★ A passenger flying from New York to Los Angeles round trip produces 3 tons of CO2, enough to fill 3/4 of a hot air balloon.
- ★ In 2005, the U.S. could have filled 1.5 billion hot air balloons with CO2 emissions. China could have filled 1.3 billion hot air balloons.

Eco-Footprint Per Capita from Selected Counties, 2003

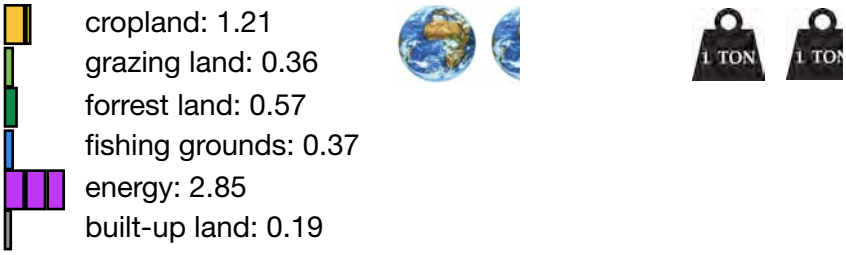
Earth's Biocapacity/Earth's Available Resources

Global Acres: 4.4 | Worlds: 1.00 | Tons CO2/year: 0.56*



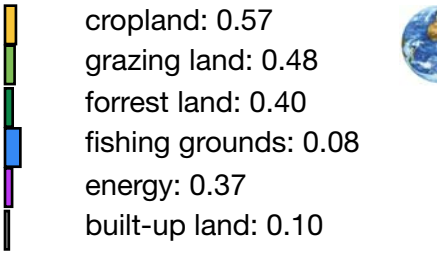
Global Average

Global Acres: 5.5 | Worlds: 1.25 | Tons CO2/year: 1.78



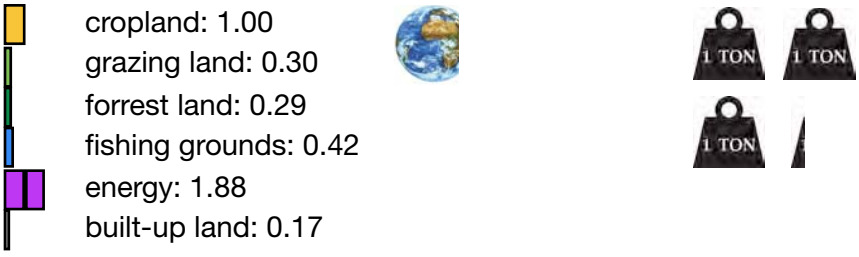
Kenya

Global Acres: 2 | Worlds: 0.45 | Tons CO2/year: 0.25



China

Global Acres: 4.1 | Worlds: 0.90 | Tons CO2/year: 3.1



United States

Global Acres: 23.7 | Worlds: 5.3 | Tons CO2/year: 20

* This number represents per capita CO2 levels at 85% below 2000 levels based on a population of 6.3 billion people. Because population is growing, an 85% reduction below 2008 levels for the 2008 world population of 6.7 billion people is 0.53 tons of CO2 per person per year. CO2 levels at 85% below 2000 levels in 2050, based on a projected population of 9.3 billion people, is 0.38 tons CO2 per person per year. Scientists recommend that the world reduce CO2 emissions 50-85% below 2000 levels by 2050 in order to stabilize emissions at current levels, which are already 1/3 higher than pre-industrial levels.

Sources: National Footprint Results 2006, Global Footprint Network, www.footprintnetwork.org & International Carbon Dioxide Emissions and Carbon Intensity, Energy Information Administration, www.eia.doe.gov

Eco-Footprint in Action

Tuna v. Salmon

Emily Sung and Colleen Driscoll spent summer 2008 as interns for Outdoor Action. They researched the environmental footprint of Outdoor Action trips and organized many of the sustainable initiatives taking place. The excerpt below is from the final report of their findings. It highlights the difficulty of finding out information about the sources and practices of manufactured products, the challenge of comparing different measures of sustainability, and the conflict of balancing sustainable decisions with comfortability.

A typical Outdoor Action group carries nine pouches (about 55 oz) of processed tuna by Starkist – which means that almost 300 pounds of tuna will be consumed by the end of this year's Frosh Trip. After digging around on a number of tuna manufacturing websites (Starkist, Bumblebee, Chicken of the Sea) and reading up on the information compiled by the Monterey Bay Aquarium's Seafood Watch program, we thought that wild-caught Alaskan salmon might be a more sustainable alternative. However, further research revealed some tough complications.

First, we found out that the tuna we've been purchasing from Starkist might have to travel as far as 14,000 miles from fisheries in the northern and tropical Pacific to local supermarkets in Princeton, NJ. Customer service representatives told us that Starkist's tuna is first shipped to Ecuador for packaging, and then shipped to Pittsburgh before being sent to retailers across the States.

Second, the species of fish and the fishing methods employed by Starkist also raised some interesting problems. According to the Monterey Bay Aquarium's Seafood Watch program, the most sustainable tuna fish options for the northeast U.S. are albacore tuna (white) from British Columbia, skipjack tuna (light) worldwide, and yellowfin tuna (light) from the U.S. Atlantic Ocean. These fisheries are well-managed, and these species grow quickly and reproduce often. We were unable to determine exactly what species of fish Starkist uses in its pouched tuna products, but it's either skipjack or yellowfin – most likely skipjack, which is cheaper than albacore and is the most commonly canned species of tuna on the market. As for fishing methods, we found out through a customer service representative that Starkist uses pole-and-line fishing and jiglining, which are two of the most environmentally responsible methods of fishing, since they have a relatively low impact on the surrounding ecosystem and they bring in relatively little bycatch (other marine life and juvenile tuna). However, Starkist also uses purse seining and long line fishing, which are generally much less environmentally responsible methods because they bring in quite a large amount of bycatch.

In our search for alternatives to tuna, we found out that Alaskan salmon is one of the most sustainably-fished seafood options available, according to information provided by the Monterey Bay Aquarium. We were able to find a number of pouched and canned salmon products sold by Chicken of the Sea and Bumblebee – both of which rely heavily on foreign-based packaging plants in Fiji, Puerto Rico, Ecuador, and other places, but primarily Thailand. After processing in Thailand, the products are then shipped to a base in San Diego, before getting shipped out again to retailers across the States. According to our calculations, a pouch of Bumblebee or Chicken of the Sea salmon would have to travel about 16,800 miles to reach Princeton – around 2,000 to 3,000 miles more than pouched tuna. Additionally, the cost of switching from tuna to salmon would be $550.

Given the incredible distances that both salmon and tuna have to travel in order to reach us, we had to admit that giving up pouched fish entirely would probably be the most sustainable course of action, regardless of our concerns about fishing methods. However, we also knew that many of our students join Outdoor Action never having

backpacked before, certainly never going six days without a toilet, shower, or living exclusively on GORP and trip food, much less adopting a near-vegetarian diet. We feel that putting familiar foods on the menu (including a small amount of meat and fish) makes it easier for them to adjust to life in the backcountry, so we decided to keep the fish for now and switch half of our tuna to pouched salmon, mainly for the educational benefit of discussing the complexity of the choices we make in our everyday diets.

Questions for Discussion:

- What were the challenges that Emily and Colleen faced while trying to find information about the two products?
- What was the carbon footprint of the tuna and salmon? What was their eco-footprint? Is there a difference between the two footprints? Would the footprints lead you to make a different choices about purchasing tuna versus salmon?
- Would you choose the tuna or the salmon? Why?

How do daily food choices affect my carbon footprint?

It is often quite difficult to determine the carbon footprint of the food you are eating. Christopher Weber and Scott Matthews of Carnegie Mellon University conducted a life-cycle assessment of greenhouse gases emitted during all stages of growing and transporting food. They found that of the 8.1 metric tons of greenhouse gases generated each year in food purchases by the average U.S. household, transportation accounts for only 11%. The agricultural and industrial practices that go into growing, harvesting, processing and packaging food accounts for 83%. In particular, red meat and dairy production were found to be responsible for nearly half of all food-related greenhouse gas emissions. More cows equals more methane, a powerful greenhouse gas, so beef and dairy have a significantly larger carbon footprint than poultry or fish.

The study found that switching to a totally local diet would reduce your carbon footprint by approximately 1000 pounds of CO2 per year. Replacing red meat and dairy with chicken, fish, or eggs for just one day per week reduces emissions by 760 pounds of CO2 per year. Eating vegetarian just one day per week cuts 1160 pounds of CO2 per year. Add these changes together and you can reduce your carbon footprint even more; buying fresh foods locally and eating less meat and dairy a few times a week doubles or even triples your reduction of greenhouse gas emissions without significantly changing your diet.

Through choices that we make every day, we can significantly reduce the carbon footprint of the food we are eating. Like hiking, everything leaves some kind of footprint. Smaller, local farms usually leave a much smaller footprint on the land by practicing less fuel- and chemical-intensive farming than large industrial farms. Similarly, grass fed beef has a smaller footprint than corn fed beef because it takes half the fossil-fuel energy to produce two pounds of grass-feed as it does to produce the same amount of grain-feed. By educating ourselves about where our food comes from and how it was produced, we can easily make decisions that reduce our impact on the planet.

Questions for Discussion:

- As a consumer, what are the factors that we can influence in our daily food choices?
- What do you look for as a consumer to make these choices?
- What are the options in the dining halls that are more sustainable?

Games and Activities: Eco-Footprint

Greatest Impact

This activity was adapted from Leave No Trace 101 by the Center for Outdoor Ethics.

This activity facilitates a greater appreciation and understanding of the participants' own personal footprint. Ahead of time make one set of "Impact Cards" from the list below. Then, gather participants and introduce the concepts of sustainability and the eco-footprint to them. Establish three locations in the play area as "impact stations." Explain to the group that this activity will help them to explore their own personal ecological footprint. This activity is also a great introduction to what impacts there are and how people view them differently.

Place three cards in three different locations on the ground and read them aloud as you set them down. Each participant should stand by the card that he or she believes has the greatest impact on the environment. Starting with the group with the fewest participants, ask the students to explain why they feel as they do about their ethical situation. After each group presents their arguments, open up the floor for a brief debate of this situation before moving onto the next one. Repeat this activity for 3 or 4 rounds.

After each round, collect the "Impact Card" that has the most people standing by it. Set these cards aside for a special round at the end of the activity to see which impact is voted worst. After the activity, open the discussion to other impacts that the group may have questions about, discuss solutions, and/or discuss the various impacts of activities on an outdoor trip.

Examples of Impact Situation Cards - and impact facts to share at end of game:

Baseline - the average American generates approximately 20 tons of CO2 annually

Fly round trip New York to LA - generates approximately 3 tons of CO2 per passenger
Drink bottled water - bottling water produced more than 2.5 million tons of CO2 in 2006, and each liter of bottled water requires 2 additional liters of water to produce
Print on non-recycled paper - forestry accounted for 17.4% of global CO2 emissions in 2004 and 95% of U.S. virgin forests have been cut; paper products account for 35% of landfills; every pound of paper requires 10 gallons of water to produce
Buy an organic apple - while considered healthier for the consumer and the land, the full impact also depends on where it traveled from and how is was produced - "organic" means foods whose ingredients cannot have been made by using most synthetic fertilizers and pesticides, genetic engineering, growth hormones, irradiation or antibiotics, but organic foods can still carry a large carbon-footprint in travel-miles and industrial farming practices.
Buy a conventional apple - it also depends on where it traveled from and how it was produced, but over one billion tons of synthetic pesticides and 21 million tons of synthetic fertilizer are used in the U.S. annually
Buy a local apple from Terhune Orchards in Princeton, NJ - this apple traveled only 4.5 miles to Princeton and the consumer has a direct relationship with the farmer
Run the air conditioner in New Jersey - produces 674 pounds of CO2 annually
Use a laundry dryer weekly in New Jersey - produces 95 pounds of CO2 annually
Take a hot 20 minute shower daily in New Jersey - produces 1 ton of CO2 annually
Annual personal driving (12,000 miles/per year) - produces 5.5 tons of CO2 annually
Annual household energy use - produces 11.3 tons of CO2 annually
Eating meat seven days a week - livestock accounts for 18% of U.S. greenhouse gas emissions; meat-eaters contribute 1.5 tons CO2 more emissions annually than vegetarians

Eco-footprint on and off the trail

This activity gives students a chance to explore. discuss and compare their ecological footprint both on an off the trail. This activity is meant to be done while on the trail and can be played over the course of several days.

Before heading out on the trail, tell the students that as they hike or paddle between now and the next break that you would like them to figure out how much of a particular resource they would all use over the course of 6 days on and off the trail. Split your students into two groups. Ask one group to discuss the amount of that resource they use on the trail for the week and the other group to discuss how much of that resource they would use at home for the week. Encourage them to be as specific as possible by calculating their estimated amount of consumption of that resource where possible - for the whole group over 6 days - and by listing all of the potential uses of that resource. As trip leaders, you can check in on the progress of the discussion and provide facts and ideas.

During the next break, ask the two groups to share their results with one another. Ask the students if they learned anything new about how and where they use that resources. Also, discuss alternatives and solutions to reduce their use.

Discussion Topics:

Water: How much water would we consume in 6 days on and off the trail? Where does our excess water go on and off the trail?
Hints: non-conserving shower heads use 5-8 gallons per minute, low flow shower heads use 1.5-2.5 gallons per minute, laundry, lawns, etc.

Fuel: How much fuel would we use on and off the trail over 6 days?
Hints: kerosene (closest equivalent to white gas) produces 5.5 pounds of CO2 per liter, approximately 3.8 liters per gallon, bus gets 6 miles to the gallon and one gallon of diesel produces 22.2 pounds of CO2, one gallon of gasoline produces 19.4 pounds of CO2

Food: How much, what type and where from? How is our food consumption different at home and on the trail?
Hints: the average food product travels 1500 miles from the farm to the plate, packaging, more meat/less meat, refer to the food sources table on page 26 for information on the trip's food supply

Electricity How much electricity would we use during 6 days at home and 6 days on the trail. What are our electricity sources? What are the environmental impacts of those sources?
Hints: batteries, "phantom loads" - electricity being drawn from battery chargers like cell phones and electronic devices with self-timers/clocks/ standby often draw more energy when not in use than when they are in use

Other Resources: Ask the groups to think about the other resources that they would be using during the week on and off the trail.
Hints: paper, waste, clothing/gear, bug repellant and other squeezable topical creams...be creative.

Leave No Trace and Sustainability

Leave No Trace is a series of principles and practices designed to reduce the impact of outdoor adventurers on wilderness areas. When applied, LNT has been very effective at minimizing a person or a group's effect on their immediate surroundings, helping to preserve limited wilderness and recreational resources for the next visitor and future generations.

In our modern society, outdoor enthusiasts have pursued wilderness as a means to slow down their pace, get away from urbanization and consumption, and to connect with nature in a more pristine form. In order to leave a wilderness area as untouched as when we encountered it, we bring the means of our survival from our homes into the wild in the form of food, shelter, clothing, and transportation. We might assume that the environmental impact of our trip is smaller than it would be if we were at home - driving to work or school, using electricity, and purchasing products - because we are living with only what we can carry and minimizing our impact on the immediate surroundings using LNT principles. In reality, the environmental footprint we carry with us on a wilderness trip may be just as large as it is at home.

For example the average work commute in the U.S. was 16 miles in 2005 - or 160 miles per week. The commute from Princeton, NJ to the Catskills is approximately 150 miles each way - or 300 miles total. Not accounting for carpooling, an individual could easily burn more gasoline on a 3-5 hour drive to a wilderness area where he or she then parks his or her car for a week as he or she would during a typical week at home. The same scenario can apply to food and gear used in backcountry travel. Millions of outdoor enthusiasts purchase a myriad of highly-specialized outdoor gear every year, only to use them a few times before upgrading to the next "break through" in gear technology. Annual sales for the outdoor industry exceeded $20 billion in 2004. Likewise, backcountry travelers often purchase processed, single-serving meals to make food more lightweight and efficient to cook. The embedded energy and packaging in these meals is easily higher than fresh meals created at home.

Leave No Trace educators often strive to make the connection from the backcountry to the home, and practices such as picking up trash from a campsite and not dumping waste (such as food scraps or soap) into a water supply certainly can translate to home and a healthier urban environment. Likewise, applying sustainability principles to Leave No Trace ethics allows us to consider the "life-cycle" impact of a wilderness trip, which starts with the choices we make in the planning and preparation for a trip and ends with the disposal of the trip's waste. Every choice we make has an impact on the environment and society, but the goal is to minimize or eliminate the negative impacts and maximize the positive impacts while enjoying our connection to place, whether at home or on the trail. What is also true is that not having a connection to nature and the environment through direct experience makes it difficult for people to feel compelled to protect and conserve the environment. So some level of impact on natural areas may be necessary to protect and secure the environment for future generations.

Outdoor Action's Sustainability Efforts

Outdoor Action took several steps towards reducing the environmental footprint of the "stuff" that goes out on trips and the "stuff" that comes back.

Food

Fact: The average food product travels over 1500 miles from the farm to the table, food production and travel now accounts for 1/5 of U.S. petroleum consumption, and food packaging accounts for 30% of landfill waste.
Conflicts: cost, finding local suppliers, and certifying sustainable practices
Goals: buy locally, buy in bulk...and successfully feed 900 people for 6 days!
2008 Results: More sustainable food products on all of the Frosh Trips include local green peppers and onions, bulk cheese powder and locally-made pasta (versus mac-and-cheese boxes), locally-made granola, canned corn and tomatoes from Pennsylvania, canned kidney beans from Pennsylvania and Maryland, local honey, and dried cranberries from New England and dried in New Jersey, switched 1/2 of the tuna products to Alaskan-salmon, which is a better-managed and healthier fishery.
Future Considerations: Are we willing to part with tuna and salmon, which are both processed over 14,000 miles from Princeton and may utilize unsustainable fishing practices? (see page 20)

Packaging and Waste

Fact: In 2007, Outdoor Action used over 18,000 plastic bags for the Frosh Trips.
Conflicts: keeping food dry and organized
Goals: reduce waste, use more environmentally-friendly packaging
2008 Results: Purchased reusable plastic containers and bulk olive oil - cost savings!
What About the Waste? (see page 27)

Equipment

Fact: Outdoor travel requires specialized gear, which is mostly made from synthetic and virgin materials and produced abroad.
Conflicts: cost, quality and durability of some "green" equipment
Goals: purchase new equipment with recycled and organic content, encourage manufactures to improve the availability and quality of sustainably-manufactured equipment, purchase locally if possible
2008 Results: Purchased 180 new backpacks and 20 new sleeping bags made with recycled materials. Each pack saves 48 plastic bottles from the landfill.
Future Goals: Continue to purchase equipment with recycled content as old equipment needs replacement.

Transportation

Fact: Each year, 20 buses and 28 support vans transport Frosh Trips to their destinations, as far as 250 miles.
Conflict: limited wilderness space around Princeton, need to spread out the physical impact of 900 campers traveling through wilderness areas.
Pretty Good Already: Traveling by bus to the Catskills uses 1 gallon of gas per person, whereas carpooling in passenger cars would use 3 gallons of gas per person.
Future Goals: Rent vans and buses that can run on alternative fuels that produce lower emissions.

Food Sources

Below are examples of nine food products going out on the Frosh Trips. While food labels show us where a product is manufactured, it rarely states the farm origin of the ingredients. This makes calculating “food miles,” the distance food travels from farm to plate, difficult.

Food	Made In	Packaging	Ingredients
Furmano's Diced Tomatoes	Produced in Northumberland, PA - ingredient source unknown	15 oz. aluminum can	diced tomatoes, tomato juice, salt, calcium chloride, citric acid
Enriched Macaroni Product	Produced in Columbia, SC, distributed from Front Royal, VA - ingredient source unknown	320 oz. bulk plastic bag	semolina flour, durum flour, niacin, ferrous sulfate, thiamine mononitrate, riboflavin, folic acid, contains wheat ingredients, processed in a facility that uses egg
Kernelettes Sweet Corn	Produced in Carteret, NJ - ingredient source unknown	15 oz. aluminum can	corn, water, sugar, salt
Starkist Chunk Light Tuna	Product of Ecuador, distributed from San Francisco, CA to Pittsburgh, PA	12 - 6.4 oz. foil pouches in cardboard box	light tuna, sunflower oil, vegetable broth(soybeans), salt
Near East CousCous	Worchester, MA - ingredient source unknown	10 oz. cardboard box	semolina flour
Peppers and Onions	Local PA farm	boxed in bulk	peppers and onions
Cheese	Vermont	wax	milk, enzymes
Apples	Terhunes Orchard in Princeton, NJ	boxed in bulk	apples
Honey	Local NJ farm 30 minutes from Princeton	12 oz. plastic container	honey

Camping and Processed Foods

It is often considered more convenient to purchase dehydrated, single serving food products for lightweight backcountry travel. As a result, campers can produce more packaging waste and consume foods with more energy used for manufacturing than the foods they purchase and eat at home. Purchasing foods in bulk, making your own granola and GORP and dehydrating your own fruits and vegetables are all good strategies for reducing your food footprint and for improving nutrition - as you control the ingredients in your foods and avoid the additives and preservatives used

Waste Plan

Please read carefully!
Proper adherence to waste on the trail will minimize the time your group has to spend on de-issuing after the trip.

This year, as part of a recently launched effort to reduce OA's carbon footprint, ALL trash and recycling will be weighed and inventoried when you return to campus. In order for this to happen, the following items must be sorted into separate bags ON THE TRAIL:

Type	Where to put it
Medical waste	Red biohazard bag
Empty cans & bottles	Yellow bag
Clean plastic bags	Collect in ONE clean plastic bag
Yucky plastic bags	Collect in ONE garbage bag
Fruit & vegetable food waste	Collect in ONE compost bag
Other food waste	Collect in ONE food waste bag
Dead batteries	Collect in ONE clean bag

Note: To make it easier, try not to accumulate multiple garbage bags. And don't mix up the different kinds of waste! Food waste shouldn't go into the yellow bag, cans shouldn't go into the food waste bag, etc. This means that if you have a half-eaten can of corn, the corn should be scraped out into the food waste bag, and the empty can should be placed in the yellow recycling bag.

How to make it easier: Make a point of getting out all the recycling and food waste bags at EVERY meal. Also, make it a priority for everyone to know who has which trash bags, just like it's a priority to know who has the gorp, the trowel kit, etc.

A last piece of advice: Sorting all your waste on the trail will GREATLY alleviate all the pain and suffering you will have to go through during gear de-issuing, and here's why. When you get back to campus, you will be asked to drop off your clean extra food, compostable food, disgusting leftover food, clean plastic bags, yucky plastic bags, dead batteries, medical waste, and miscellaneous trash at SEPARATE STATIONS. If everything is mixed up together, it will take a long time to sort it all out at the stadium. But if all your waste is already sorted into different bags, you'll be in and out of the stadium in no time.

Did You Know?

Princeton students and employees are each responsible for 4.6 pounds of trash per day for an annual total of 251 million tons of trash. More than half of that volume ends up in landfills.

Reduce, reuse, recycle... rethink!

Games and Activities: Sustainability

Teachable Moments

There are many opportunities to discuss the new sustainable practices taking place on your Frosh Trip. The best times to integrate these discussions are during your regular interactions with the objects you want to discuss. For example, mention that there are 18 new backpacks and 20 new sleeping bags made with recycled materials going out on the Frosh Trips; point out the foods that are more sustainable when you are sitting down for a meal; and discuss the benefits of recycling, composting and minimizing waste and share Outdoor Action's goals to weigh the trips' waste streams when handing out the waste bags. Refer to the sample itinerary on page 5 for recommendations on when to share trip sustainability facts with your group. By bringing up quick examples of sustainable efforts early on and throughout the trip, you can then lead to deeper discussions and activities knowing that the group has some tangible examples to build on.

Here is a simple strategy to use in creating a teachable moment. It comes from Sharing the Joy of Nature by Joseph Cornell, and it is called "flow learning" because the four stages flow into one another smoothly:

1. Awaken Enthusiasm: express your own enthusiasm or interest in a subject
2. Focus Attention: get everyone's attention
3. Direct Experience: allow the group to interact with the subject, share facts
4. Share Inspiration: tell a story, ask the group to share their own examples, play a game

Orange Bandana Activity

The bandana activity is a way to bring focus to the final debrief through an activity. Leaders should carry the bandanas during the week and **not** hand them out until the last night. On Thursday evening distribute the clean bandanas and the black markers and ask the following:

- Each group member to write their name on their bandana.
- Ask each person to write one of their high point moments on the trip on their bandana.
- Ask everyone to think about one important part of their full value contract that they want to remember to help them in their first year of Princeton. Ask each person to write that on their bandana.
- Ask each person to write something they've learned on the trip about being in a diverse community on their bandana
- **Ask each person to write one thing they can do to be more sustainable on campus**
- If you want, you can include the bandana as part of an activity like Fill My Cup.

What is “sustainable” food?

During a meal lay out several food products from the chart on page 26, including fresh fruits and vegetables, packaged products, and bulk products. Ask the group to look at the labels on the products or the chart to see where they came from. Share that the average food product travels over 1500 miles from the farm to the plate and represents a significant portion of foods’ environmental footprint. Point out the food products that were changed this year to be more sustainable and have a smaller footprint (page 25). Ask the group to organize and rank the food products in terms of their “food miles,” how far they traveled to get from their origin to this campsite.

Then ask the group what additional environmental impacts are associated with food production (for example, fertilizers, pesticides, machinery, manufacturing energy, packaging, labor, raw materials, etc.). Pick up one packaged item and ask the students to trace all of the steps that went into its manufacturing. For example, where did the raw materials came from for both the food product and the packaging? If the food is a meat product, what did that animal eat and did their food need to be processed and transported too? What would make this particular food product more sustainable? Ask the students if this new information re-prioritizes what they define as more sustainable and less sustainable food products. Ask them to re-rank the food items by their overall sustainability.

Ask the group to define local, organic, and conventional food products. Discuss the differences, benefits and drawbacks of each choice. Ask if there are additional criteria that should be considered beyond local, organic or conventional when making sustainable food choices (such as vegetarian, packaging or manufacturing intensity).

For further discussion, read “How do daily food choices affect my carbon footprint?” and answer the questions on page 21.

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