Forest Floor Decomposition  
by Elizabeth Tomkins

As we welcome the fall season of the year, we anticipate the sights and sounds of the earth preparing for cold weather ahead. A familiar characteristic of this seasonal change is the beautiful display of leaves falling from the branches of deciduous trees, gracefully twirling through the air in an arrangement of beautiful bright colors and patterns. The dropping of leaves is necessary for these species to conserve energy in harsh winter conditions when lack of sunlight makes any efforts of photosynthesis unprofitable. In addition, the layering of these fallen leaves will also contribute to the overall health and fertility of the forest floor below. Crisp red and yellow leaves perfect for raking into a large pile may become damp as they settle in your backyard overtime. The transformation, possibly taking you by surprise as you make a running leap, is a wonderful example of a natural resource beginning to break down and return to the soil where its life first began. This process is called decomposition and contributes to the livelihood of many forest-dwelling organisms, down to a microscopic level.

Decomposition starts when organic matter, such as a plant or animal that has died, rests upon the forest floor for a long period of time. This organic matter becomes a source of food for creatures such as vultures (animals only), earthworms, beetles, snails and others. The scientific term, detritivore, is used to categorize these creatures that are the first to begin to consume remains. Eventually the organic matter will be broken down into a nutrient-rich substance called humus. Humus is a darker soil found in the upper most layer of earth in the forest which greatly benefits the growth of plants. Various forms of fungi and bacteria, known as decomposers, will then feed upon the humus, releasing inorganic nutrients (non-living molecules without carbon) into the ground. The soil of a productive forest environment holds a variety of inorganic nutrients, available to be absorbed through the roots of plants and bodies of some organisms. The three major types of nutrients are nitrogen (a building block of protein, involved in the production of chlorophyll in plants), phosphorus (assists with the process of storing and transferring energy for plants) and potassium (helps with osmosis and enzyme activation). These three inorganic molecules also contribute to the overall pH or acid/base condition of the soil. Soil found within a natural forest region is commonly more acidic.

Nature generates and regenerates the forest soil with a combination of fungi, bacteria and other decomposers. These organisms break down the remains of dead plants and animals and mixes the material with nonliving components in the environment such as air water and minerals.

From a research perspective, the presence of nutrients and woodland creatures found within a region of soil can be considered an indication of efficiency for a forest habitat. A bal-

photo credit: Wayne Henderek
anced variety of both detritivore and decomposer organisms suggests steady decomposition. A high level of negatively charged molecules such as nitrogen is expected to increase soil quality. To gain a thorough understanding of the components of soil within a studied area, a tool called a soil auger is often used for sample collection purposes. When vertically inserted and pulled back out of soft earth, this tool will hold a column of soil to provide a considerably accurate sample of all visible layers. The most important layers for a test of nutrients are horizons O and A (respectively the topmost layers). These are the layers that contain humus, the most fertile soil, and are where a majority of plant growth occurs. After a soil sample is collected and allowed to settle and dry, various laboratory instruments and test kits can be used to determine humus content, approximate level of nutrients such as nitrogen and potassium, and a value of pH.

A Berlese-Tullgren funnel is a research instrument used for capturing and studying fauna in the soil and litter layer.

A study of present detritivore and decomposer invertebrates can also be accomplished using methods such as the Berlese-Tullgren funnel. For the types of organisms mentioned, an ideal habitat includes variables such as abundant shade and moist soil. The design of the Berlese-Tullgren funnel eliminates these variables by placing the organisms under a form of direct light, which over a period of a few days begins to dry out the organic matter sample they are contained in (such as leaf litter). These unsuitable conditions encourage the organisms to move away from the light, eventually causing them to slide through the funnel and fall into a collecting chamber below. Once collected, the organisms can be identified and sorted using a microscope.

Overall, the equally magical and scientific process of decomposition is yet another fascinating example of the earth’s ability to naturally recycle energy and resources. While shuffling through the leaves, passing by a fallen tree cloaked in fungi or observing a turkey vulture circle overhead on a windy fall day, one can find appreciation for each and every organism contributing to the rejuvenation and strength of the surrounding ecosystem for many seasons to come.

References


Elizabeth Tomkins worked at WCSP for the past two summers as a seasonal naturalist as well as in other capacities. She is currently a third year undergraduate in Environmental Management at SUNY in Cobleskill, NY. Ms Tomkins hails from the Newtown, PA area.

**Make a Worm Compost Jar**

A fun way to learn more about the process of decomposition is through observing the life of an earthworm! Create your very own decomposition observation container with the materials shown in the figure to the right.

- Place layers of material such as damp dirt, sand and mulch into your jar. Add a generous amount of dead leaves and other organic matter such as chopped vegetables as your top layer. Put on the lid, cover your jar and keep in in a cool, dark place.
- Introduce earthworms obtained from outdoors or from the store, into the observation container. Red worms are considered best for composting and can be purchased at a fishing store or wherever bait is sold.

After a couple of weeks, begin making regular observations. Look at how the material in the jar changes over time. Notice the behavior of the earthworms and the presence of previously undetected organisms.

**Volunteer Notes**

**Paul Moran**, Allentown, has been working diligently maintaining our trail system.

**Bob Hughes**, Yardville, (Bob’s Buzzy Bees) provided medication for our observation honeybee hive as well as some sage advice on feeding that resulted in rejuvenating a previously-weak bee colony.

**Ellen Coleman**, Ewing, donated some stock for our garden and came in to staff the Nature Center in September.

**Jim Wade**, Princeton, delivered a great presentation on Native American stone resources.

**Around the Park**

- WCSP and its surrounding area experienced an unusually wet, hot and humid second half of the summer after a cool spring. All of the park’s streams are seasonal and tend to dry up by the middle of July in most years. This year, they retained water for a good part of the summer.
- Camp groups from Pennington and Trenton visited the WCSP Nature Center this past summer. Programs provided to these groups included River Romp, Build a Rope Bridge, Tyrolean Traverse and the Group Adventure Experience Course. Public programs provided at the Nature Center were Night Hike, Recreational Kayaking Workshop, Kayak the Canal, Family Nature Walk, Solar Observing, Trees of the Park, In Search of Shale and Full Moon Bike Hike. Please see the enclosed program schedule for upcoming public events.
studies, ropes activities, trail hikes, maple sugaring, geology, forestry, forest and field ecology, map and compass and much more. For a comprehensive listing of over 35 topics, go to our web page (http://www.state.nj.us/dep/parksandforests/parks/washcros.html), scroll to the Nature Center and click the link for “groups such as schools, scouts, clubs and local organizations”. Alternatively, call the Nature Center at (609) 737-0609 and request a group program listing. We are currently scheduling for fall, winter and the spring months.

### Primitive Skills

Primitive Technologies Day this year will be a one-day event scheduled for Sunday October 7, 10:00 a.m. – 4:00 p.m. Volunteers will be on hand that day at the park Nature Center, demonstrating their expertise in primitive technologies and life ways as park visitors pass through and informally tour the venue. Demonstrations will be available in flintknapping and Native American stone artifacts, fire-by-friction, shelter building, prehistoric weapons and traps, cordage construction, and possibly a variety of other primitive skills. WCSP has been sponsoring this event annually for over twenty years. It has always been a very fun, enlightening and exciting afternoon for visitors, volunteers and staff alike. The event will take place rain or shine. Please call the WCSP Nature Center or see the enclosed program schedule for further information.

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**Nature Center Group Programs**

The WCSP Nature Center offers a great variety of outdoor education and interpretive programs to schools, homeschool groups, scouts, community groups, religious organizations, summer camps, youth organizations, etc. Programs are available under the broad categories of ecology and natural resources, survival and self-sufficiency, adventure, and outdoor navigation. Some of our programs are tailored for young children. Others are designed for older kids and adults. Some of our interpretive programs meet specific scout badge requirements. Some of our programs are academic in nature; others are recreational or discovery/adventure-oriented. All of them are exciting and fun for participants. Popular examples would be pond, river and stream.
The following is a list of activities being offered through the Nature Center at Washington Crossing State Park in Titusville, New Jersey. These events are available to families and individuals only. Programs for scouts, schools, home school groups and other groups are available and scheduled separately by special arrangement. These programs are offered free of charge unless otherwise indicated. Some of these events will require advanced registration as specified below. Attendance is limited and is available on a first-come, first-served basis. All children must be accompanied by an adult. All programs will initially meet at the Nature Center unless otherwise indicated. In the event of inclement weather, some programs might be canceled. It is always advisable to call ahead before coming out. Phone: (609) 737-0609.

**PRIMITIVE TECHNOLOGIES DAY** (all ages) *Sunday October 7, 10:00 a.m. – 4:30 p.m.* Archaeologists and primitive technologists from throughout the region will be on hand demonstrating and discussing a variety of primitive skills that local Native Americans and indigenous people from throughout the world practiced in prehistoric times. Stone tool making, fire building, edible and useful plants, primitive weapons and traps, and possibly more will all be included.

**LOCKATONG FALLS HIKE** (preteens – adult) *Sunday October 14, 1:30 – 4:30 p.m.* Lockatong Creek in Delaware Twp. has many interesting cascades and rock outcrops along its banks. We will drive to the Lockatong Wildlife Management Area and follow the White Trail loop from the parking area, down to the falls and back (approx. 3 miles). Meet at Niederer’s Pond on Church Rd. We will carpool to the Wildlife Management Area (call the Nature Center for directions).

**HIKE MILFORD BLUFFS** (pre-teen-adult) *Saturday October 20, 10:00 a.m. – 2:00 p.m.* Milford Bluffs in Holland Twp., is a relatively recent acquisition to the state park system. It contains mature hardwood forests, agricultural fields and interesting rock outcrops. The terrain is gently rolling and rugged with commanding views of the Delaware Valley. Wear sturdy shoes, bring drinking water and lunch. The hike will be 2-3 miles in length. Meet at Niederer’s Pond on Church Rd. We will carpool (approx. 45 min ride) to the preserve (call the Nature Center for directions). Advanced registration required.

**PARK FOLIAGE HIKE** (9 yrs. - adult) *Sunday October 28, 1:30 - 4:30 p.m.* This is a naturalist-guided 3 1/2 - 4 mile hike taking on the park’s natural and historic areas, and several interesting and remote sections of the park during the fall foliage season. Wear sturdy footwear. Bring drinking water, a snack and a pair of binoculars.

**SHELTER BUILDING WILDERNESS SURVIVAL** (6 yrs. - adult) *Sunday November 4, 1:30 – 3:00 p.m.* This program will deal with the fundamentals pertaining to survival when lost in the wild. Participants will construct a weatherproof shelter completely from native materials. Advanced registration required. Fee: $2.00/person, (exact change please) children under 6 yrs free.

**NATIVE AMERICANS OF THE AREA OF THE PARK** (all ages) *Sunday November 11, 1:30 p.m.* Jim Wade, former archivist and researcher with the N.J. State Museum will discuss primitive stone tool use by Native Americans in central New Jersey. Emphasis will be on the significance and importance of the Indian way of life during the autumn season, focusing on the activities of fall hunting, gathering and religious ceremonies. The program will include a slide presentation and Native American artifacts will be on display. Seating will be available on a first come, first served basis.

**FAMILY NATURE WALK** (all ages) *Saturday November 17, 1:00 – 2:00 p.m.* Join us for an informal naturalist-guided trail walk.

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**MORE WCSP EVENTS NEXT PAGE**

New Jersey Department of Environmental Protection  Division of Parks and Forestry
Nature Center events continued

GEOCACHE WASHINGTON CROSSING STATE PARK (preteens – adult) Saturday December 1, 1:00 – 3:30 p.m. Geocaching is a high-tech update on the old-fashioned scavenger hunt game, which utilizes GPS (global positioning system) technology to locate objects hidden in the park. Participants will learn how to obtain information and hints from the Geocaching.com website, on the location of dozens of geocache sites in and around the state park. They will then use handheld GPS devices to go out and find as many caches as possible. Once a cache is found, participants typically will sign in on the log contained within and then take an object from the cache box after leaving a trinket for subsequent geocachers. Participants should bring a pocket full of trinkets to exchange when they locate caches. Trinkets can include small toys and balls, plastic jewelry, pens, pencils, scratch pads, patches, action figures, coins, etc. A limited number of GPS navigation devices will be made available to participants on a first come, first served basis. Bring your own handheld GPS device or smart phone with Geocaching app installed if you have one. Advanced registration and payment required. Fee: $2.00/person (exact change please).

HOLIDAY WREATH MAKING (all ages) Saturday December 8, 1:00 - 3:30 p.m. Participants will construct their own wreaths from evergreen clippings collected in the park. Advanced registration and payment required. Fee: $8.00/wreath (exact change please).

Have a Happy Holiday Season

Autumn Programs
at the
Visitor Center Museum
(609) 737-2515

MUSKET FIRING DEMONSTRATION. Saturday October 6, 2:00 p.m. Join a Park Historian for an interpretive talk about some of the weapons used during the American Revolution and their use during the Battle of Trenton. Included will be a musket firing demonstration. $1.00 program fee.

RECREATING THE BATTLE OF TRENTON IN A MINIATURES WAR-GAME. Saturday, October 20, 1:00 p.m. The Battle of Trenton will be recreated by using miniature figures, dice and “Flint & Steel” rules developed by Richard Kane who will also be managing the game. Visitors can observe or participate as the historic military commanders. Free.

CANNON FIRING DEMONSTRATION. Saturday, November 3, 12:00 – 4:00 p.m. Lamb’s Artillery Company will be conducting artillery demonstrations at 12:00, 1:30, 2:30 & 3:30. Free.

LECTURE “The Christmas Night Crossing”. Saturday, December 15, 2:00 p.m. Using diaries and letters of the participants, Resource Interpretive Specialist Clay Craighead will give a lecture on the significance of the Christmas Night Crossing and the Battle of Trenton. Free.

THE CHRISTMAS DAY CROSSING REENACTMENT. Tuesday, December 25, 1:00 p.m. Commemorate the 242nd anniversary of George Washington’s famous Christmas Night crossing of the Delaware River by viewing the annual reenactment. Free.

(more WCSP events next page)
Autumn Programs
at the
Johnson Ferry House
(609) 737-2515

**GIVING THANKS** - Origins of our Thanksgiving Holiday. Saturday November 17, 12:00 p.m. - 4:00 p.m. It includes the history of this unique American celebration, Hymns and music, hearth cooking, and other domestic activities in the Johnson Ferry House or in the Stone Barn. Good family event.

**LANTERN WALKING TOURS**  Friday, December 21 at 7:00 p.m. and 7:30 p.m. Three historic sites by night beginning at the Nelson House, the Stone Barn shop, and the Johnson Ferry House. Refreshments included. Advanced registration required at 609-737-2515.