OPEN SPACES

STAMFORD LAND CONSERVATION TRUST, INC.

"Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has." — Margaret Mead

SUMMER 2014

SOIL: A LIVING RESOURCE

PROTECTING OPEN SPACE

— Dr. Abigail A. Maynard —

WHEN ASKED "WHY PRESERVE LAND AS OPEN SPACE?" MANY REASONS COME TO MIND. Having sufficient amounts of contiguous natural lands is vital to the health of our environment and to preserving clean water and air. Open space promotes healthier, active lifestyles, preserves habitat for native plants and animals, and provides nesting and breeding sites for birds. By protecting open space, we are protecting woodlands and fields for the plants, birds, insects, and animals that are essential for biodiversity and ecological balance in our communities. What is sometimes overlooked is that we are also protecting the soil beneath our feet.

Photo by Sue Sweeney

Since the early 19th century, researchers have recognized that soil is an active and ever-changing body. Among the most underappreciated habitats on earth, soil is the critical life-support system on which all terrestrial biodiversity depends. It acts as a water filter, a growing medium, and provides habitat for billions of organisms that contribute to biodiversity. Soil also provides shelter for insects, reptiles, birds, and animals. At the very time soil ecologists are beginning to uncover the magnitude and importance of the soil biome, the resource itself is literally disappearing off the face of the earth.

Human activities are the greatest threat to our soils. A recent study by the UK's Royal Commission on

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PRESIDENT'S LETTER

— Richard Chiaramonte —

THIS ISSUE'S THEME, "WHAT LIES BENEATH?" IS AN EXPLORATION OF BALANCE AND INTERDEPENDENCE. Life above ground supports and enhances life below. And vice versa—life below ground supports and enhances life above. The two worlds are interdependent and demonstrate the importance of biodiversity. Once we pave over or build on open space, we disrupt this interdependence, and we interrupt the way a healthy planet functions.

And here again comes the idea of balance. We need buildings (after all, we live and do business in them and the best of them are truly works of art) and roadways and parking lots. But we also need, as balance to that, the places where biodiversity can flourish; where what's above the ground and under the ground can work together to make their contribution to a more productive (and more pleasant) environment for all of us.

To get a good idea of what's going on under your feet as you stroll the paths of our forests and meadows and even your own backyards, take a look at our feature article, "Soil: a Living Resource" by Dr. Abigail A. Maynard. Also, our friend Sue Sweeney tells us about the remarkable (and difficult to observe) interconnectedness of tree roots. I was amazed to learn that trees support each other (much like good friends in a mutually supportive community) within the forest environment. Sue also tells us about the world of voles and the tunnels they make, both for their own use and that of others. Remaining beneath the surface, Beatriz Moisset reveals the nutritional cooperation between tree roots and the parts of the fungi we don't see (the parts underground). Each of these articles reminds us of the interdependence of the biomass above and the biomass below the surface.

We all know, almost instinctively, that everything in nature—which is just about everything there is—is connected. The relationships between nature's work, above and below ground, is one demonstration of that. It is hard to see, but it is there and it is important to preserve.

If you are interested in a very visible example of how the removal of one species (and its subsequent return) can profoundly affect an ecosystem, take a look at the four minute video about the wolves of Yellowstone. It can be found at http://blog.ted.com/2014/02/18/video-how-wolves-can-alter-the-course-of-rivers/. It's not in Stamford and it isn't underground, but when it comes to biodiversity, it is great food for thought.

Thanks, as always, for your support and for caring about the environment.

See you in the woods,

SOIL: A LIVING RESOURCE *(CONT. FROM PAGE 1)*

Environmental Pollution concluded that some 10% of the world's soil has already been lost this century through deforestation, erosion, urban development, and other abuses of the land. Approximately 30% of the world's arable crop land has been abandoned because of severe soil erosion in the last 40 years. As it takes 500-1,000 years to form 1 inch of soil, soil is being lost at rate of 13 to 80 times faster than it is formed.

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What is in soil? Soil is composed of four major components: minerals, organic matter, water, and air. Soil minerals, which provide physical support for plants, are derived from rock that has been broken down over time by wind, water, and chemical processes. These minerals are the source of many metals such as iron, aluminum, and zinc. Organic matter consists of decaying plant and animal matter and contains many of the nutrients essential for plant growth. Water and air are, of course, required by all living organisms, including plants, for growth.

Soil organic matter is made up of many different kinds of compounds—some more useful to organisms than others. In general, soil organic matter is made up of roughly equal parts humus—a relatively stable form of carbon that can remain in the soil for decades, or even centuries—or active organic matter. Active organic matter consists of organic compounds that are available to soil microorganisms. Bacteria tend to use simple organic compounds, such as root- or fresh-plant residue. Fungi tend to use more complex compounds, such as fibrous plant residues, wood, and soil humus. Intensive agricultural practices trigger spurts of activity among bacteria and other organisms that consume organic matter and convert it to CO_2. On the other hand, practices that build soil organic matter, such as reduced tillage and land preservation, encourage the conversion by soil organisms of active organic matter to humus. Humus is stable because bacteria and fungi have helped form carbon molecules that are too complex and large for soil organisms to decompose. Soil stores carbon dioxide and other greenhouse gases as soil organic matter and soil organic matter is actually the major global storage reservoir for carbon. Land management practices can be chosen to increase the amount of carbon sequestered as soil organic matter and reduce the amount of CO_2, a greenhouse gas, released to the atmosphere. Thus, soil organic matter plays a major role in stabilizing and regulating the earth's climate. Soil organic matter offers several added benefits: It filters and cleans water, enhances water retention and storage, mitigates the impacts of extreme weather events, reduces soil erosion, and serves as a source of long-term, slow release nutrients.

Soils harbor a diverse community of living organisms, both animals and plants. In fact, there are more living individual organisms in a tablespoon of soil than there are people in the world. The staggering diversity of organisms in the soil may be orders of magnitude higher than above ground diversity of plants

and animals, but no one has yet made an exhaustive census of soil organisms in even a single natural habitat. They range in size from the tiniest one-celled bacteria, algae, fungi, and protozoa, to the more complex nematodes (tiny wormy things) and micro-arthropods, to the visible earthworms, insects, small vertebrates, and plants. In most cases, microorganisms make up 90-95% of the total weight of organisms in soils. And, in fact, almost all of the antibiotics we take to help us fight infections were obtained from soil microorganisms. According to the Global Biodiversity Assessment "a single gram of temperate forest soil could contain 10,000 million individual cells comprising 4,000-5,000 bacterial types, of which less than 10% have been isolated and are known to science." In addition more than 500 species of soil invertebrates (e.g. snails, earthworms, termites, mites, nematodes etc.) have been recorded from a beech forest; over 2,500 species of fungi have been identified from a few acres of land in southwest England. Clearly, the soil is home to a large proportion of the world's genetic diversity.

Soil organisms are not uniformly distributed through the soil. Each species and group exists where they can find appropriate space, nutrients, and moisture. They occur wherever organic matter occurs—mostly in the top few inches of soil, although

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microorganisms have been found as deep as 10 miles in oil wells. Bacteria are concentrated in the rhizosphere, the narrow region directly around the roots. They feed on the sloughed-off plant cells, and the proteins and sugars released by roots. Protozoa and nematodes that graze on bacteria are also concentrated near roots. Thus, most of the nutrient cycling and disease suppression needed by plants occurs immediately adjacent to the roots. In the litter (leaves, twigs, roots) and humus, fungi are common as well as some bacteria. Both bacteria and fungi are able to access a larger surface area of plant residue after shredder organisms such as earthworms, leaf-eating insects, millipedes, and other arthropods break up the litter into smaller chunks.

The activity of soil organisms follows seasonal patterns, as well as daily patterns. In temperate climates, the greatest activity occurs in late spring when temperature and moisture conditions are optimal for growth. However, certain species are most active in the winter, others during dry periods, and still others in flooded conditions. Not all organisms are active at a particular time. Even during periods of high activity, only a fraction of the organisms are active. The remaining portion is barely active or dormant.

The entire soil community or biota influences a huge range of ecosystem processes that contribute to the sustainability of life on earth. Activities of soil organisms include

the physical breakdown of plant litter by insects and earthworms and the chemical breakdown or decomposition of these materials by microorganisms. They also may change the physical structure of soils by creating large pores that are capable of transporting water into the soil. This enhances the productivity of the soil by increasing water infiltration, thereby reducing surface water runoff and decreasing soil erosion. Termites, earthworms, and other burrow-building soil organisms enhance soil productivity by churning and mixing the upper soil, which redistributes nutrients, aerates the soil, and plays a critical role in the formation of topsoil. Other organisms produce compounds that stick mineral particles together, changing the pore structure, and making it easier for plant roots to penetrate. Soil organisms enhance crop productivity because they recycle the basic nutrients required for all ecosystems, including nitrogen, phosphorous, potassium, and calcium. Nitrogen is the main nutrient required for growth in plants and for building proteins in animals. Nitrogen-capturing microorganisms that live symbiotically on the roots of leguminous plants and trees make an enormous contribution to global agricultural productivity especially where alternative sources of fertilizer are either unavailable or unaffordable.

Despite the importance of soil biodiversity to life-sustaining processes, soils are one of the most neglected habitats on earth. In most cases, soil biologists simply don't know which organisms or groups of organisms play the most important roles in ecological processes. They don't know which soil organisms are being lost, or what impact these losses will have in the future. There is general consensus that we are losing soil biodiversity. Many microbes live symbiotically with higher organisms. Thus, every plant and animal that becomes extinct is likely to take several species of microorganisms with it. Soil ecologists believe that it is essential and urgent to establish the cause and effect relationships between the loss of soil biodiversity and its impact on terrestrial and global ecosystem processes. Only by understanding life in the soil can we begin to conserve and better utilize its life-sustaining processes.

So the next time you take a walk through our fields and forests, don't forget the teeming community in the soil beneath your feet. Enjoy the birds singing, the majestic trees, and the wildflowers blooming, but also appreciate the soil ecosystem upon which everything else you see is dependent. And also realize, while it is easy to fight to save an animal or plant species, it is just as important to fight to conserve the hidden but vital soil community.

Dr. Maynard is an agricultural scientist in the Department of Forestry and Horticulture at the Connecticut Agricultural Experiment Station in New Haven, CT. She is currently in charge of the New Crops Program where she conducts trials on ethnic and specialty vegetables.

There are more living individual organisms in a tablespoon of soil than there are people in the world!

THE WOOD WIDE WEB

IN THE FOREST, AN INTERCONNECTED WORLD LIES BELOW OUR FEET

— Beatriz Moisset —

Photo by Sue Sweeney

TAKE A LOOK AT MUSHROOMS, those delicious morels or boletus or the deadly Amanita you see scattered through the forest. They look like a trivial component of the plant community compared to the trees that tower over your head. Each of those mushrooms is a "fruiting body," similar to a fruit, except that it produces spores rather than seeds. The mushrooms are the visible parts of a large organism buried underground and called a fungus. Imagine an apple tree where only the apples are visible sprouting above the ground while the whole tree is spreading its branches underground. Such an "apple tree," the main part of the fungus, is a peculiar kind of organism made of an intricate web of thin threads, called hyphae, connecting with themselves again and again when they meet, like a huge tridimensional spider web.

Certain fungi also link with the roots of trees, wrapping around them and penetrating their bark. They are called mycorrhiza (plural: mycorrhizae or mycorrhizas), meaning fungus-root. They do no harm to plants; instead they establish a vital partnership with them. Their threadlike tendrils absorb water and minerals from the soil more efficiently than roots do and transfer some of them to the plants. In return, the fungus receives the sugars and vitamins that plants synthesize. This cooperative venture benefits both partners.

The fruiting bodies of some mycorrhizae are so small that they go unnoticed by most of us, or they are underground truffles. All included, mycorrhizae benefit at least eighty per cent of all species of plants to some extent. The relationship probably originated when the first pioneer plants climbed on land, around 425 million years ago, before tree ferns and dinosaurs.

The hyphae of one species intertwine with themselves and also with those of closely related clones. They connect with the roots of not just one tree, but several. They do it again and again, forming countless links. This is the "Wood Wide Web," so called by those who study these relationships. The bridges they form are capable of carrying water and minerals and even other nutrients not just from fungus to plant and vice versa, but also from tree to tree. Thus a fir tree connects to another fir tree and also links to the birch tree beyond them. When you walk in your vegetable garden, little do you know that the leek is communicating with the carrot by means of the unseen web right under your feet!

A majestic old tree, surrounded by younger ones, forms a hub, from which the fungal network radiates in all directions like the spokes of a wheel maintaining continuous communication among all its parts. Thus, mycorrhizae behave like the stewards of the forest. In the spring, when the birches are leafless, the mycorrhizae take nourishment from the firs and carry it to them. Later on, when the leaves of birches cast shadow over the fir trees and these need some food, the web reverses its flow, taking nutrients to from the birch to sustain the fir tree.

MY EXPERIENCE IN OPEN SPACE

WONDERS OF NATURE

— Tara Gravel —

We shouldn't forget to mention another member of this complex community, the squirrel; or, in some cases, beetles or other seemingly insignificant creatures. You may have seen a squirrel breaking a piece of a toadstool and running up a tree to eat it at leisure. The spores will travel down its digestive tract and will eventually be dropped away from the original mushroom. This is the way the mycorrhizae enlist the squirrel's services to reproduce.

To many people the word fungus means "disease" or "plant damage." In the case of mycorrhizae it means "connectivity," "cooperation" or "healthy plant communities."

Dr. Moisset is a biologist with a doctorate from the University of Cordoba, Argentina. She studied neurochemistry and behavior during a postdoctoral at the Jackson Laboratories in Bar Harbor, Maine.

OPEN SPACES—THE QUIET PLACES WHERE NATURE IS LEFT TO THRIVE—GIVE BACK TO US TENFOLD. We just have to be alert and receptive to the gifts. They're little things, like the scent of freshly fallen leaves, blueberry bushes ripe with fruit, a startled grouse making a hasty exit from the undergrowth, a rare lady's slipper orchid.

Once, when walking through the woods near my childhood home in Pennsylvania, enjoying a warm spring day, I stumbled on a tiny, rust and white-spotted ball, curled up alongside the path. Deer weren't an unusual sight, but to be steps from a days-old fawn was breathtaking. Its big brown eyes met mine. I knelt down and stayed quiet, wanting to observe as long as possible without upsetting the mother, wherever she was. To my astonishment, the fawn stood, wobbled over to me and leaned against my side. I stroked her back once or twice. She stayed there for a minute, then took a few tentative

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steps past me, and lay down again. I could hear mama's hooves in the thicket of rhododendron behind me. It was time to go.

But a part of me is still there, astonished and grateful for the wonders of nature.

Tell us about your exceptional experience in open space by emailing us at info@stamfordland.org or posting on our Facebook page. Your story could get published in our next newsletter!

It takes 500 years to form an inch of topsoil.

One gram of soil holds about 5,000 different types of bacteria!

FLORA FILES

THE UNDERGROUND WORLD OF TREES

— Sue Sweeney —

WE OFTEN THINK OF OUR LOCAL TREES AS UNCOMPLICATED, SOLITARY, USEFUL BEINGS—givers of shade, providers of oxygen, storehouses for carbon, home to squirrels and birds. These tall, quiet neighbors of ours, though, have much more going on than we ever imagined.

In the last few decades, we discovered that tree roots do not mirror the tree top but instead spread out laterally around the trunk in a circle up to 2 times the tree's height. We now know that most roots don't go deeper than a foot or two, maximum 3 to 6 feet—a major limiting factor being the lack of oxygen (e.g. due to soil compaction). We have learned that, when trees are given the choice, many of the delicate, critical feeder roots, complete with their symbiotic mycorrhizae [See Beatriz Moisset's article on this fascinating subject on page 6], are spread throughout the airy, fragile duff layer of decomposing leaf litter. We are starting to appreciate that trees are enormous creatures with such substantial reserves that damage done to their roots today may not show up in their crowns for a decade or more.

We have long known, because we can see it, that forest trees support each other above ground. For example, the trees at the forest edge are stronger than those in the middle. When the edge trees are cut down (e.g., for a right-of-way), many of the neighboring trees will also fall in the next decade or two when a storm pushes too hard in the direction of weakness. We have recently learned that when a tree produces chemicals to fight off an insect or pathogen, other area trees sense the chemicals in the air and start making the defensive chemical.

However, what goes on between trees underground in the "earth ocean" can be as mysterious and even harder for us to observe than what's going on under the deep seas. We are, however, beginning to learn. We have long known that, in a mature forest, tree roots weave together into mats so complex that it is difficult to trace the roots of a particular tree. We have also known that some of our other local trees, most notably the American beech, spread into large colonies by means of root suckering, and that these trees seem to stay interconnected in some way.

What we have recently discovered is that spontaneous root grafting is occurring below the ground, transforming solitary trees into larger living organisms. It has now been established that over 150 types of trees will graft root systems with trees of the same species and occasionally with trees of other species. Probably many more species do this but underground activity is difficult to study. Local species whose root fusing habits have been examined include our familiar, lovely white pines (Pinus strobus) and our wonderful underappreciated Tupelo (Nyssa sylvatica), also known as black gum.

Where trees share root systems, the trees have been proven to share water, oxygen, nutrients, and even the

all-important mycorrhizae. It's been established that the larger, better-situated trees help out their less fortunate kin. This sharing leads to the remarkable phenomenon of "living stumps"—where a tree has been cut down but the stump lives on for decades or even centuries due to shared roots.

However, for better or worse, much more travels through the root networks. For the better, when one tree manufactures chemicals in its roots to fight off an herbivore or pathogen, the chemicals are transmitted throughout the root network. For the worse, pathogens also travel thorough the networks; Dutch elm disease has been proven to do so. Also for the worse, systemic pesticides such as broadleaf weed killers and insecticides can travel through these networks killing much more than the applicator intended.

There's much more to learn and new research papers are coming out frequently, but what we know so far underscores the interconnectedness of just about everything on earth. All the more reason to preserve and protect the natural world.

CRITTER FILES

MOLES AND VOLES: TINY, PROLIFIC TUNNEL MAKERS

— Sue Sweeney —

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AS THE SNOW MELTS IN SPRINGTIME, look for long networks of tiny tunnels in the snow. Other times of the year, look for barely submerged tunnels in leaf litter, at the base of thick turf or under objects that have been lying on the ground for a while. Who makes these tunnels? Mostly it's voles. Meadow voles are also known as meadow or field mice. The woodland vole is also called a pine mouse. Connecticut also has a swamp vole but it's not so big on tunneling, particularly in snow. Voles are tiny, round kin to beavers and muskrats, with the same hairless tails as muskrats. Voles are almost exclusively herbivores and are happy munching on grass, even the dried stuff from last summer that lines the floors of their snow tunnels. Unfortunately, voles are also delighted by just about everything in your garden from bulbs to the bark of sapling trees.

The tunnels are warmer and drier than the open air, and are some protection against predators. When examining a tunnel system, look for bedrooms, eating areas, and escape hatches. When the snow cover is intact, you might also find air shafts. Other small critters that occasionally make snow or surface tunnels or use the ones that the voles made are white-foot mice and deer mice (both omnivores) and, occasionally, shrews (carnivorous predators-classified as insectivores but they'll partake of vole when they can catch one). Moles (insectivores), for the most part, stay safely underground. The meadow vole is said to have distinguished itself with the highest reproductive rate of any mammal in the world, including lemmings. The bright side: wildlife experts agree that the voles' main job is to feed owls, foxes, and hawks. While the tunnels make it harder for our sharp-eared, keen-eyed predators to find voles, one squeak and it's all over. Indeed, in winter, the Internet abounds with humorous pictures of red fox snow-drift diving for voles. So, around the tunnel areas, check the snow and leaf litter for signs that the predators have also been at work. If you're lucky, you might see the tracings of owl wings.

Area gardeners agree that voles can cause significant damage. Vole control is beyond the scope of this piece but, please, remember "poison a rodent, poison a raptor"—possible victims include even the visiting snowy owls.

FOREST LAYERS

WHAT YOU'LL FIND UNDERGROUND

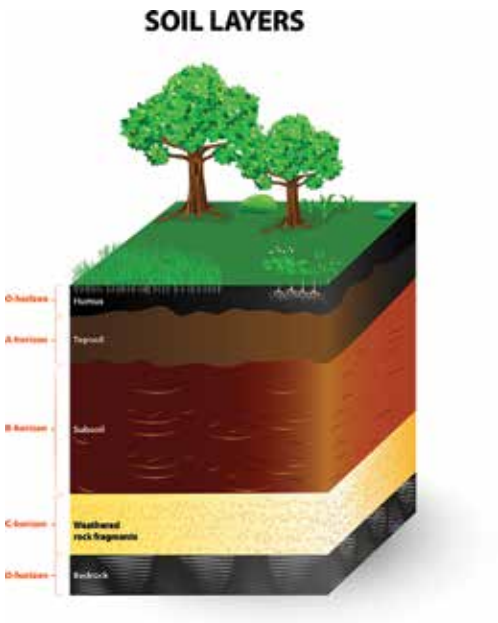
— Steven Danzer Ph.D. —

SOIL IS MUCH MORE THAN THE DIRT ON YOUR KNEES. Whether you are in the garden, forest, field, desert or mountains, soil is the glue that keeps it all together. There are almost infinite variations depending on the environment where it is found.

What we think of as "soil" not only changes as we walk about on the landscape, but it changes as we dig vertically as well. Those who have had the pleasure of preparing a garden, or digging a posthole have the opportunity to observe how the soil changes with depth. Below are some quick facts about what you'll find:

» A typical column of forest soil is about 45% minerals, 25% water, 25% air, and 5% organic matter. The first few inches, technically designated as the "A horizon," and referred to more generally as "top soil," is mainly organic matter, and contains the bulk of the biological life within the soil; the bacteria, fungi, protozoa, nemotodes, arthopods (spiders), and earthworms. Top soil is colored dark by the organic matter, and is often capped by a thin layer of leaf litter on its surface.

» Digging a few inches below the A horizon, most forest soils change in color and mineral composition. This is the subsoil, or "B horizon," which no longer contains abundant organic matter. If the soil is well drained, the soil color is often a brighter yellow to red, reflecting the rusting of the mineral particles due to abundant oxygenation after frequent wetting from rain. If drainage in the soil is poor, then the soil color may be more bleached, due to the leaching of coloring agents such as iron and other minerals out of the soil layer. The bleached color is the color of its native silica particles.



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» Digging deeper, the next layer encountered would be the "C horizon." This is where the soil most closely resembles the underlying bedrock. The soil here has only been slightly altered by physical processes such as freezing and thawing, and has virtually no biological activity. Depending on where you are on the forest landscape, the C layer may be encountered as shallow as 6-8 inches (when on the top of a ridge or hill), or as deep as 4 feet or more (when on a slope, or at the bottom of a slope).

» Lastly, depending how deep you are digging, groundwater is frequently encountered. Usually the groundwater level fluctuates according to the season, with the highest levels during the late fall to early spring. This is the water that eventually nourishes our local streams and rivers. It usually is not exploited by most residential wells, which pump water from fractures in the deeper bedrock, underneath the soil.

Dr. Steven Danzer is the Chief Land Steward for the Stamford Land Conservation Trust. He is also a Soil Scientist and a Professional Wetland Scientist in private and municipal practice.

The top 6 inches of soil in one acre of land contain 20,000 lbs. of living matter!

REVENGE OF THE WORMS

BIG. BAD. INVASIVE. THERE'S A NEW NIGHTCRAWLER IN TOWN

— Richard Chiaramonte —

I REMEMBER, AND MAYBE YOU DO TOO, when we were kids we'd go out on a hot humid summer night after a rainstorm and gather worms we called nightcrawlers. We'd pretend to race them on the paved driveway or patio (not where our squirmy friends were at their happiest), and sometimes even keep them overnight in jars so we could use them for fishing the next day (hey, we were kids). But now the tables have turned. Now we have the Revenge of the Worms!

Worms are mostly invertebrates, varying in common and storied name from grubs to dragons and in size from microscopic to over 180 feet in length (this is a marine worm known scientifically as Lineus Longissimus—a sensible name for such a creature). And they live everywhere, from parasitic niches to oceans, rivers and trees.

Specifically, of the over 5,000 worm species scientists have discovered so far, the critical critter in question is Amynthas hilgendorfi and agrestis, commonly known as the Asian Earthworm. According to recent worm science, worms in North America were essentially wiped out during periods of glaciation. Soil scientists believe our current crop was reintroduced as they travelled here from Asia and Europe with imported plants and even in the soil ships once used for ballast. While we could surmise this importing began with Columbus, it really picked up speed in the 1700's as more and more settlers came to North America.

Over many years, leaves, twigs and other organic debris accumulates on the forest and meadow floor. This thick layer is called "duff," and is often considered nature's perfect fertilizer. The duff layer is broken down by microscopic invertebrates and holds moisture like a sponge. This process provides nutrients for plants large and small and this plant life provides nesting and food for small animals and birds. The problem is this: the Asian worm lives by eating and digesting, hence destroying, this important duff layer.

While it is easy to make light of what often sounds like a B movie plotline, the damage Amynthas is doing is increasingly serious. When there were only a few of our tubular friends, they aerated the soil and were considered beneficial. But over time they have reproduced at a rate rabbits would envy and now we have many too many doing what amounts to unpreventable damage to a critical layer of soil.

So what's to be done? Apparently, not much. Some areas of the country are experiencing an increasingly serious problem (the northern mid-west and, oddly, the Philadelphia area) and others are not…yet (southern New England. It seems oak leaves are hard to digest). Synthetic pesticides have been found to create collateral damage and, in maintained garden areas, plants have a range of soil requirements. Some researchers have found the earthworm population may be lowered by creating a more acidic soil. This can be done by mixing granulated sulfur and a generous amount of oak leaf litter into the soil. A professor at Pennsylvania State University has also found that a fertilizer known as Early Bird, made from tea seed meal, has helped reduce the earthworm population on grass areas.

So far we are lucky. Our local forests don't provide the food these sliders like to eat. But keep your eyes open and consider taking up fishing—a LOT of fishing.

WORD SEARCH

LOOK FOR AND THEN CIRCLE THESE WORDS:

BASIDIOMYCOTA
BEDROCK
BLASTOCLADIOMYCOTA
CARBON
CHITIN
CHYTRIDIOMYCOTA
CLAY
DECOMPOSITION
DRAINAGE
EARTHQUAKE
ECOSYSTEM
EDAPHOLOGY
ELUVIATED
EROSION
EUKARYOTIC
EUMYCOTA
FILTRATION
FUNGUS
GASES
GLOMEROMYCOTA
GROWTH
HABITAT
HUMUS
INVASIVE
LAYER
LIFE
LIQUIDS
LUMBRICINA
MATTER
MEDIUM
MICROSPORIDIA
MINERALS
MOLDS
MYCOLOGY
MYCOREMEDIATION
MYCOTOXINS
MYXOMYCETES
NEOCALLIMASTIGOMYCOTA
NITROGEN
OOMYCETES
ORGANIC
ORGANISMS
PEDOLOGY
PEDOSPHERE
PERMEABILITY
PHOSPHORUS
PLANT
POROSITY
PURIFICATION
REGOLITH
SAND
SCOMYCOTA
SILT
SOIL
STORAGE
SUBSOIL
SUPPLY
SYMBIOTIC
TOPSOIL
WATER
YEASTS

WE DIG THESE DEN DWELLERS!

Plenty of familiar local creatures spend time underground. Here are a few, in completely unscientific order of cuteness:

River Otters
Rabbits
Foxes
Mink
Chipmunks
Woodchucks
Spotted Salamanders
Spring Peepers
Skunks

Who did we miss?
Visit the Stamford Land Conservation Trust Facebook page and let us know!

A N I Y D Z D T U A S N O B R A C A J G N G

A V I I E N U A V U T Q N R E T T A M R R N

G T A T I B A H B P H O S P H O R U S U E K

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R O O M Y C E T E S I C Y U A B A Z E I T W

O L U M B R I C I N A Y E A S T S C M O O J

S O H O M M Y C O R E M E D I A T I O N X N

I G R O W T H H T I L O G E R E R N Y E I Y

T Y L B D P L M M C M X W V E V I S A V N I

Y D N A J N S U P P L Y F M I N E R A L S Y

S T O R A G E X H G D M F U N G U S T T P B

EXPERIMENT: JARRING PROOF OF LIFE!

Who lives in your soil? Along with earthworms, there are many microscopic creatures, such as nematodes, bacteria and protozoans. They produce carbon dioxide as a waste product, just like you. To prove it, you need a big glass jar and lid, a small container that fits inside the jar, a bottle of lime water (water with calcium hydroxide) from the drug store, and a generous scoop of soil.

Put the soil inside the jar and put the smaller container on top. Fill the smaller container 2/3 full with lime water and leave it open.

Close the jar lid tightly and wait a few days, watching for changes in the water.

Because lime water turns milky in the presence of carbon dioxide (it's really forming chalk), a milky color is proof of the diversity of life in your soil.

Adapted from
HowSutffWorks.com
Science Projects for Kids: Soil Experiments

NEW & NOTEWORTHY

MILL RIVER IS ROCKIN'!

If you haven't been to Mill River Park lately, you're in for a treat with a full range of free (and inexpensive) family activities this summer. Movies under the stars, kids' shows, the Pork in the Park BBQ contest, a concert by the Stamford Symphony Brass—there's something for everyone. While you're there, look for the SLCT tree and dedicated plaque. See MillRiverPark.com for an event schedule.

HOUSEHOLD HAZARDOUS WASTE DAY

From house paint to batteries, pesticides to cleaners, you can dispose of any household hazardous waste on July 19th from 9:30 a.m. to 2 p.m. at Rippowam Middle School at 381 High Ridge Road. See www.stamfordct.gov/solid-waste-recycling for more information and other recycling news.

VOLUNTEERS WANTED

Are you an agile and expert Tweeter and Facebook poster who knows how to generate a following? We're looking for a social-media-savvy volunteer to help with our Twitter and Facebook accounts, posting weekly updates, photos and news. Please contact us at social@stamfordland.org if this sounds like you!

STAMFORD LAND CONSERVATION TRUST

22 FIRST STREET, STAMFORD, CT 06905-0247 | STAMFORDLAND.ORG | 203.325.1850

Won't you join us?

Enclosed is my: ❑ Individual Membership $25 ❑ Family Membership $50 ❑ Sponsor $100
❑ Partner $500 ❑ Benefactor $1,000 and over ❑ Total Donation $_____

Name _____

❑ Check this box if this is a new address

Address_____
City _____State _____ Zip _____
E-mail _____
I would like to volunteer my services
❑ Land Steward ❑ Land Donation ❑ Other_____

Please send all mail to: Stamford Land Conservation Trust, 22 First Street, Stamford, CT 06905-0247

Contributions to the SLCT are tax deductible.

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MISSION STATEMENT

The mission of the Stamford Land Conservation Trust is to seek and accept land through donations or by purchase to hold in perpetuity as open space. The SLCT acts as steward over such lands. It assists governmental and non-governmental organizations to protect and preserve open space.