January 2019-Vol.5 No.1

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The Soil Food Web: Nature’s Way to Build Healthy Soils

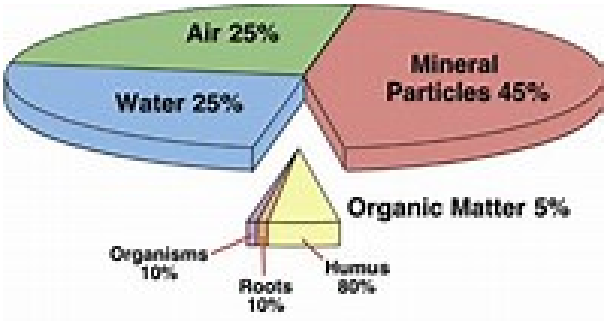
By Ralph Morini | January 2019-Vol.5 No.1

Soil is the foundation for life on earth. It provides habitat, recycles wastes, provides structural and nutritional support as well as air and water needed for plants, and ultimately, all life to thrive. Over the past 100 years, humans have departed from the natural practices that built the sustainable system we now call the soil food web and replaced it with more industrialized practices. Deeper tilling upset soil structure and displaced soil organisms. Natural soil amendments have been replaced with chemical fertilizers. The reduction in soil organisms weakened natural control of soil borne diseases and pests, leading to use of chemical pesticides. Herbicides replaced old-time weed management practices.

Despite dramatic increases in food production, there is growing concern about loss of topsoil, runoff-induced pollution, potential negative health effects of agricultural chemicals, the need for ever-stronger chemicals as organisms develop resistance to current remedies, and the loss of bio-diversity that pushes the world further away from nature’s healthy balance. It seems that modern agriculture is a short term success with negative long-term consequences.

The good news is that there is increasing recognition of the situation, a growing sustainable agriculture movement, and a developing understanding of what is required to achieve sustainability.

What is Healthy Soil?



Soil Composition Photo: physicalgeography.net

Conceptually, healthy soil is soil as nature evolved it over millennia. It is built on the community of plants and organisms that thrive in it and in turn enable each other to thrive. It consists of four major components: mineral and organic matter, air and water.

Of these, organic matter is the most important. This is because it impacts soil texture, structure, water movement and availability, and provides nutritional support for the organisms that comprise the living part of the soil food web, the basis of healthy soil.

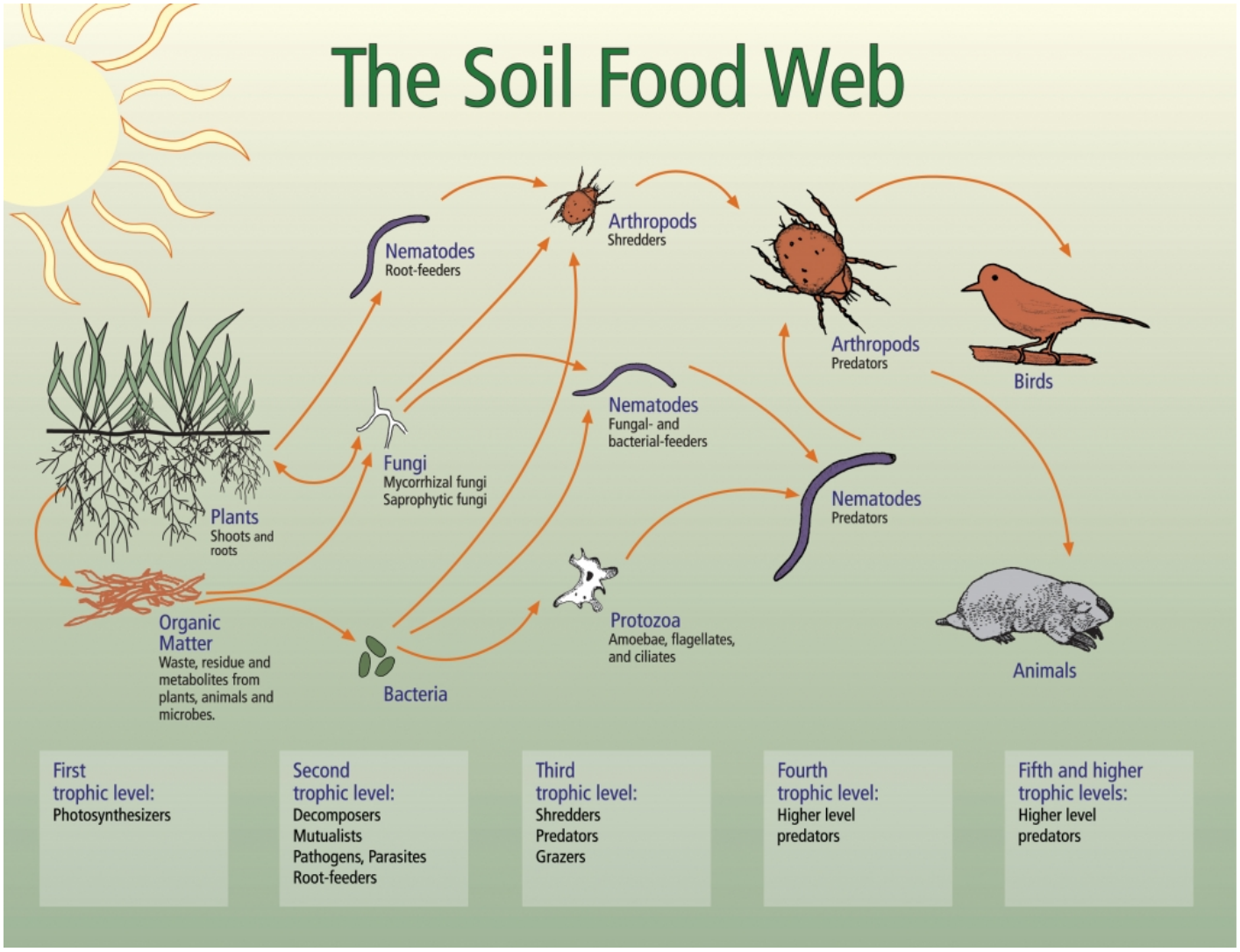


Photo: www.ncrs.usda.gov

The Soil Food Web

The Soil Food Web is the combination of organic matter and the community of organisms that decompose it in the soil. At the base of the web are bacteria and fungi which consume and decompose organic matter

directly, converting nitrogen to plant-usable form and storing it in their bodies. Protozoa and nematodes prey on bacteria and fungi, releasing nitrogen to plants.

Larger organisms also play a role in decomposition. Arthropods — including millipedes, springtails, mites, fly larvae, and beetles — break down organic matter while they themselves provide food for other beneficial arthropods. The community also includes insects, earthworms, and larger mammals like moles, mice, and rabbits that spend part of their time in the soil, plus birds and other predators that prey on them.

Food Web Function

The plants and organisms that make up the soil food web, combine with air, water and minerals in the greater soil ecosystem, to provide a life support system for plants. The relationships and interdependencies are many:

- A **community of organisms** provides the decomposition function that recycles natural nutrients back into the soil, reducing soil organics to long-lived organic matter called humus.
- **Bacteria and fungi** convert nitrogen from forms that plants are unable to consume, into ammonium (NH4+) and nitrate (NO3-) that are plant-accessible.
- **Bacteria and earthworms** exude a slime that binds soil particles together, aggregating them into a structure that provides pore space for air and water passage through and storage in soil.
- **Fungi** are the primary decomposers of the web. They grow threadlike structures called *hyphae* that in turn form mats called *mycelia* that can cover large areas when undisturbed. They release enzymes and acids that penetrate and break down tough *chitin* and cellulose plant tissue, and absorb plant nutrients into their cellular structure by osmosis (*chitin* is the substance in the exoskeletons of arthropods and insects). Fungal hyphae can transport nutrients over significant distances, and once inside the fungus, the nutrients are immobilized and not lost from the soil.

Mycorrhizal fungi attach to root systems and extend their reach
Photo: thinkingcountry.com

- Specific fungi called **mycorrhizae** form symbiotic relationships with plants by either surrounding or penetrating root systems. They draw the carbohydrates they need from the host plant's exudates while extending into the soil, sending moisture and nutrients that the root system wouldn't otherwise reach, back to the plant.
- **Other types of fungi**, living both below and above ground, provide benefits, including emitting toxins that kill harmful insects, improving seed germination and attacking soilborne disease carriers.
- **Protozoans**, larger single-celled organisms, prey on bacteria and fungi, while ingesting organic matter. Their wastes "mineralize" the nutrients that have been "immobilized" by the fungi and bacteria, making them available to plants. Because bacteria and fungi live in the "rhizosphere" — the area surrounding plant roots — the nutrients are accessible to plants. As much as 80% of the nitrogen needed by plants comes from wastes left by protozoa.
- **Nematodes**, non-segmented blind roundworms, eat smaller microbes, also performing a

mineralizing function. Because they are larger, they require more porous soil structure in order to travel, arguing for building and maintaining a good texture and structure. Bacteria attach to the skin of nematodes, which inadvertently transport the relatively immobile bacteria into new areas as they search for food.

Soil arthropods: Photo: groworganic.com

- **Arthropods**, like flies, beetles and millipedes, are more visible because of their size, but their total bio-mass is actually less than the microscopic organisms. Most are shredders, increasing the surface area of organic material that is available to microbes, speeding decomposition. Some work on the soil surface, but many spend time below the surface, mixing and aerating the soil, taxiing microbial life into new areas and leaving waste products that add organic matter. Other familiar arthropods include mites, springtails, termites and ants.

Earthworm castings: Photo: wormsetc.com

- **Earthworms** are also shredders. They eat bacteria, fungi, protozoans, nematodes and the organic matter the organisms live on. They have gizzards that grind everything up as it passes through the worm's body. Digestive enzymes of bacteria living in worm intestines release previously locked-up nutrients. Worm wastes, called castings, typically contain 50% more organic matter than soil not processed by earthworms. In addition, earthworms increase soil porosity, water holding capacity and organic matter. They break up hard soils, create root paths, bind soil particles together into aggregates and move nutrients and microbes through the soil.
- The **birds, reptiles and mammals** that prey on other organisms of the web as well as plants growing from it, contribute by leaving wastes that become microbial food sources that are recycled into plant nutrients, move microbes residing on their bodies to other locations and at death, leave carcasses that are decomposed by soil life.

This summary isn't all-inclusive, but illustrates the community of organisms that, combined with organic

materials, form an interdependent system that works to build and sustain healthy soils.

Strengthening Your Soil Food Web

Start with an assessment of your soil condition by physically examining a sample. Dig a one foot square hole. Place the soil on a tarp and sift through it. Finding worms or their castings is a good sign and indicative of the presence of microbes. Similarly, the presence of centipedes, millipedes, beetles, spiders and springtails suggests a healthy food web.

Get a soil test: Submit a soil sample to your agricultural extension. Request data on pH, nutrients, % organic matter, soluble salt content and Cation Exchange Capacity. While preferred pH can be a function of specific plants to be grown, most soils want to be in the 6 to 7 pH range. Aim to build organic matter to about 5% of soil composition. Soluble salt content indicates whether over-fertilization may be harming soil organisms. Cation exchange capacity (CEC) indicates whether positive electrical charges carried by clay particles and humus are adequate to absorb negatively charged nutrient particles to prevent them from leaching away as water passes through the soil.

Add Organic Matter:

Compost can be purchased or home-made from yard and kitchen plant scraps. It is rich in a variety of microbes, and is composed primarily of humus, which is fully decomposed organic matter. The humus is light and loose, which helps aerate while holding moisture and nutrients until they can be released to plants. Guidance for backyard composting can be found in the article Basic Composting from the January 2018 issue of The Garden Shed.

Compost tea: Photo: vegetariat.com

Actively aerated compost tea (AACT) is a much touted but somewhat controversial way to add beneficial microorganisms to soil. It is different from the compost or manure leachate long made by gardeners by suspending a bag of compost or manure in water for a period of time. Leachate is anaerobic, while AACT is aerated, which increases beneficial microbes. AACT is made by adding compost to chlorine-free water and pumping air through it for a couple of days, fostering aerobic bacterial growth. There are many retail AACT systems available and DIY building instructions on the web. Only a small amount of compost and a couple of days are needed to make enough tea to treat a typical home plot. The National Organic Standards Board of the US Department of Agriculture offers these recommendations to minimize pathogen risk and maximize benefits:

- Use only potable water
- Sanitize all equipment immediately after use
- Use only hot compost that has reached a minimum of 131 degrees F for 3 days during decomposition
- Avoid using additives, sometime suggested to increase microbe growth, to minimize pathogen risk
- Don’t apply to edible plant parts including seed sprouts

Note that while many organic gardeners recommend applying AACT as a foliar spray to reduce disease, research has been inconsistent, probably due to variation in initial compost. Best use of AACT is to stimulate microbial activity in soil with adequate organic matter, rebuilding microbe activity in lawns that have been chemically treated and in compost bins. Its positive effects in these applications appear safe and well-supported.

Organic mulches can also help build the web. These include leaves, leaf mold, pine needles, grass clippings, wood chips, straw, seaweed, plant remnants and paper. Besides smothering weeds, enhancing appearance, moderating soil temperature, retaining moisture and reducing erosion, mulches provide a home for soil organisms and add organic material and nutrients as they decompose. Application rules are simple. Chop the material up and let it age. Install **up to a 3″ thick layer** for best results. Mulch to the drip line of trees. Keep mulch 3-4 inches away from tree trunks.

Minimize inversion tillage and compaction

Turning garden soil over annually is no longer recommended. It disrupts microbial populations by changing their depth in the soil, unnecessarily speeds up organic decomposition and destroys soil structure. Recommended practice is to add a couple of inches of compost to the soil surface and work it into the top 4-6 inches manually or with a chisel plow. Let the food web organisms finish the job.

Avoid Compaction. Wheel and foot traffic reduces porosity, affecting soil and air storage capacity as well as limiting food web organism diversity and abundance.

Cover crops in raised beds Photo: westcoastnotebook.com

Cover crops offer an alternative to mulching during winter and fallow periods. They create soil cover and reduce erosion. Crops with tap roots reduce compaction and create pore space. Fibrous roots promote aggregation and soil stabilization while reducing leaching losses. Legume crops fix nitrogen. Typical cover crops are annual rye, clover, hairy vetch, and field peas. Plant them a month before frost; broadcast seeds and lightly rake the soil surface. In the spring, cut the cover crop before seed maturation and use the vegetation as a mulch; alternatively, you can compost the cut vegetation, or if immature, work it into the top soil layers 3-4 weeks prior to planting.

Reduce Pesticide Use: Broad spectrum pesticides harm beneficial insect populations. Increase habitat for beneficial organisms and add to bio-diversity to reduce the need for chemicals.

Manage Nutrients. Use organic amendments whenever possible. If you have to use chemical fertilizers, manage quantity carefully. Synthetic fertilizers deposit nitrate salts in soil that can harm soil microbes. The more chemical is applied, the more microbes die and the more chemical is needed. And so the destructive spiral begins.

Mulch grass clippings and leaves with your lawn mower and leave them on the lawn. For microbes to live in lawn soil they need to be fed. This is the logical way to do it.

Add mycorrhizal fungi to plantings. There are two types: **Ectomycorrhizae** surround roots of hardwoods and conifers and extend out from them. **Endomycorrhizae,** which penetrate roots and extend outward, are preferred by vegetables, annuals, grasses, shrubs, perennials and softwood trees. Buy the spores at garden centers as powders or solutions and follow application directions. Bare root transplants can be dipped or have the spores sprinkled on roots. Mix spores with seeds and into the backfill or on external roots on potted plants. The objective is to get spore-root contact, along with moisture to initiate germination.

Gardeners as Part of the Solution

Whether a commercial grower or a home gardener, if you’re accustomed to using synthetic fertilizers and pesticides, it takes a leap of faith to trust the natural solution. On the other hand, it is hard not to

acknowledge the risks associated with the chemical-based approach. There is a growing population of successful agro-ecology practitioners who illustrate that natural practices work. They worked for millennia until human technology intervened. Given all that we have learned, using nature's proven methods just seems like the right thing to do.

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Good Seeds, Bad Seeds

By Cleve Campbell | January 2019-Vol.5 No.1

The seed catalogs just keep rolling in. All the incredible pictures accompanied by irresistible gourmet descriptions. But before filling out the order form or hitting an online seed site, there's one uncompleted task: seed inventory, those left over seeds from years past. As I dig though the seed boxes, I am amazed to be **finding seeds that are 5 and 6 years old and older**. Before ordering new seeds, there's that nagging question, are the seeds good, will they germinate and grow if planted? I don't want to buy more if they are good.

Where to start: look at the package. Most seed companies stamp it with a "packaged for" date. Some years ago, I got into the habit of writing the year on the seed packet because sometimes when I open the packet, I rip through the packing date, rendering the package date unreadable. I find that writing the date on the package when I purchase or receive them in the mail is a form of insurance. The next step: do I remember the variety? Did it perform up to my expectations or the expectations created by those wonderful descriptions in the seed catalog? My wife and I have had many a debate on how certain varieties performed; were they good performers, just okay performers or a total disappointment? Memory often becomes a little foggy when trying to recall how a certain variety performed last gardening season and what happened 3-4 years ago. There have been many interesting conversations about planting aged seeds which usually ends with a show-stopper my wife brings out from time to time, "Well, if they were so great, why do we still have seeds left over from 8 years ago?" To which my only rational response is, "Obviously, we ran out of garden space." Of course, rereading the seed descriptions in the catalog are of little help, all of the varieties described in the seed catalogs look and sound like amazing gourmet treats. The only true way of solving the

mystery is going **back to the garden journal** and checking out my notes. Hopefully, I entered a detailed description on how well each variety performed that year, and whether or not to plant that variety again. So I grab the "ACE" tomato seed packet labeled 2009 and I go searching for my 2009 journal. Over the years I have come to the conclusion that a garden journal may be the most overlooked and valuable garden tool in a gardener's quiver.

Having retrieved my 2009 journal, I find the "ACE" tomato entry: outstanding performer, prolific, beautiful fruit, wonderful taste. No wonder I hung onto the seeds. Now the next question is : are the seeds still good? A couple of factors come in to play, but the most important factor is the variety, since some vegetable varieties have a longer shelf-life than other varieties.

Viability of Vegetable Seeds

(Average number of years seeds may be saved)

Vegetable	Years	Vegetable	Years
Asparagus	3	Leek	2
Bean	3	Lettuce	6
Beet	4	Muskmelon	5
Broccoli	3	Mustard	4
Brussels sprouts	4	Okra	2
Cabbage	4	Onion	1
Carrot	3	Parsley	1
Cauliflower	4	Parsnip	1
Celery	3	Pea	3
Chinese cabbage	3	Pepper	2
Collard	5	Pumpkin	4
Corn, sweet	2	Radish	5
Cress, water	5	Rutabaga	4
Cucumber	5	Spinach	3
Eggplant	4	Squash	4
Endive	5	Tomato	4
Kale	4	Turnip	4

Chart adopted from Virginia Cooperative Extension Publication

The second variable is how they were stored. Moisture, heat, and fluctuating temperatures are a seed's worst enemy. Conditions essential to good seed storage are just the opposite of those that are required for good germination. Good germination occurs when water and oxygen are present at a favorable temperature, so eliminate these elements to ensure a long shelf life for your prized seeds. Don't simply abandon your leftover packets to the elements by leaving them in a garden shed. Seeds that are stored in moisture- and vapor-proof containers in a cool, dark area will last at least a year, and if the container is stored below 40ºF., as in a refrigerator or freezer, the shelf life may be extended. On the other hand, if the seed packets were merely stuck in a box and set on a shelf in the garage or the mud room where they were exposed to last summer's tropical heat and humidity, even long-lived seeds might not germinate well.

So what to do? Gamble on the old seeds or buy new ones? **There is simple way to conduct a home germination test on the leftover seeds.** To find whether a package of seeds will germinate and grow**, perform this simple home germination test :**

- Place 10 seeds an even distance apart on a damp paper towel.
- Roll up the towel and place in a plastic bag. Why ten seeds? Because the number is easily calculated for germination expectancy in terms of percentages. So if only 6 seeds sprout, you'll know that the germination rate is 60%.
- Leave the damp, rolled towel in a warm spot for three to five days.
- Check the towel moisture each day and add water when necessary. You can start checking the seeds as early as 3 days after setup. If you find moldy seeds, count them as dead and remove them or the mold may spread to other seedlings. You can count and remove the healthy seedlings as they develop. Keep track of how many days it takes the seed to germinate for future reference. The test is over when all the seeds have germinated or the normal number of days to germination is up.
- The percentage of seed germinating in the towel will give you a fairly good idea how the same seeds will do in the garden.

Now back to the mystery of why I had those wonderful ACE tomato seeds in my seed inventory so long. As I was researching another tomato variety from 2011, I found I had replaced the ACE variety with a wonderful Cherokee Purple heirloom variety. The "ACE" seeds were stored in the freezer and I am going to do a germination test. If they germinate, I can always find room in the garden for one more tomato plant. I'm guessing the germination test will pass with flying colors, thanks to the freezer. I often smile at a package of Rutgers seed that I purchased in 2001 that have been stored in the freezer and which still have a germination rate of 70-80 percent.

Thanks for stopping by *The Garden Shed*. We are looking forward to your visit next month.

Sources:

"Seed for the Garden," Virginia Cooperative Extension, Publication 426-316, pubs.ext.vt.edu/426-316

"How to Test your Stored Seed for Germination," Oregon State University Cooperative Extension, extension.oregonstate.edu//how-test-your-stored-seed-germination

"Home Germination Testing," Seed Savers Exchange, www.seedsavers.org/HomeGermTests

In the Vegetable Garden- January

By Cleve Campbell | January 2019-Vol.5 No.1

Well, 2018 has come and gone. While in the midst of cleaning out the garden back in October, the seed catalogs began to show up in the mail box; now there's time to look them over. Can spring be far behind? For the vegetable gardener, winter is a time to look back and to look forward. What's that old saying? — "Don't put off until tomorrow those things you can do today." January brings an opportunity for reflection and to get prepared for a new year with new gardening opportunities. Following is my to-do list for January:

- **Look back and learn from 2018**. This means: get rid of all those 2018 seed catalogs, review old seed order forms as a reference for new seed orders, and review the garden journal for what worked and didn't work. What! –no garden journal? Make a New Year's resolution to start a 2019 garden journal. This can be a valuable tool in planning the new garden and deciding what varieties to plant. Remember that when it comes to a garden journal, the more information noted in the journal, the better.

- **Complete seed catalog orders now** before specific desirable varieties sell out. Order early in the month to take advantage of promotional offers of free seeds or discounts for early orders. As you review seed catalogs, choose disease-resistant varieties. They not only make gardening easier and more enjoyable, they reduce expenses and environmental pollution from pesticides.

- **Perform seed inventory** and **run a germination test on "old" seeds stored** from previous years to see if they still sprout. A little online research located numerous sites, including various seed companies, that offer information on home seed germination testing. One such site from Oregon State University offers basic and simple instructions for "How to Test Your Stored Seed

for Germination”. Handle seed packets carefully. Don’t try simply rubbing the packet to determine a “feel” count as this can break the protective seed coating, thus reducing germination.

- **Begin collecting containers** that can be used for transplants, such as styrofoam cups and yogurt and sour cream containers.
- **Clean crusty clay pots** with a vinegar/bleach solution. To make the solution: add 1 cup each of white vinegar and household bleach to a gallon of warm water and soak the pots. For heavily-crusted pots, scrub with a steel wool pad after soaking for 12 hours.
- **Clean and inventory seed flats**; soaking flats in a **bleach solution — a ratio of 10 parts water to 1 part bleach —** will kill disease-causing microorganisms.
- If you are **spreading the ashes from your fireplace** or wood-burning stove in your garden, be aware that, over time, you are **raising the pH of your soil**. It may be time to have your soil tested for the pH before applying more wood ashes. For more information on wood ashes, check out our Garden Shed article titled “Wood Ashes” .
- Review the All-America Selections website for new 2018 vegetable winners for possible new planting candidates.
- Save plastic mesh bags in which onions and oranges usually come; they make ideal storage sacks for air-drying onion, garlic and shallots.

Thanks for stopping by **T*he Garden Shed.*** We are looking forward to your visit next month. In the meantime, we wish you and you family and safe and happy new year.

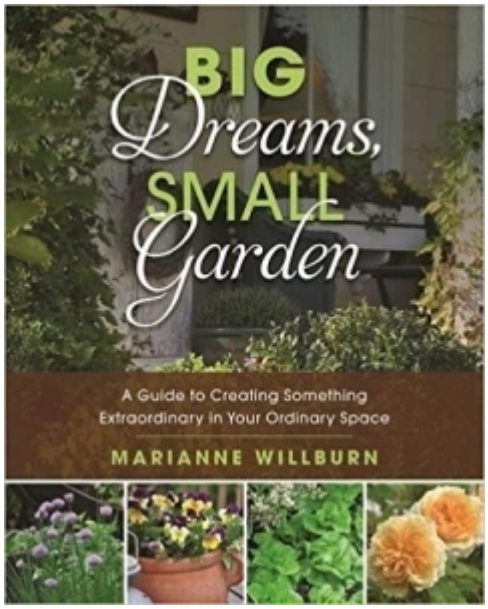
Garden Dreaming

By Cathy Caldwell | January 2019-Vol.5 No.1

I don’t know about you, but I found the growing season of 2018 to be discouraging. Ridiculous amounts of rain followed a dry spell, and most of my garden plants seemed to just put their heads down and give up — even the zinnias (but not the stiltgrass). And discouraged is not any way to start off a new year in the garden. So I’ve decided to spend my winter hiatus gathering as much inspiration as possible so as to be ready to launch myself into spring gardening renewed and refreshed and ready to go. I’ve looked far and wide and I’m here to share what I’ve found — from books to podcasts to television shows.

Books

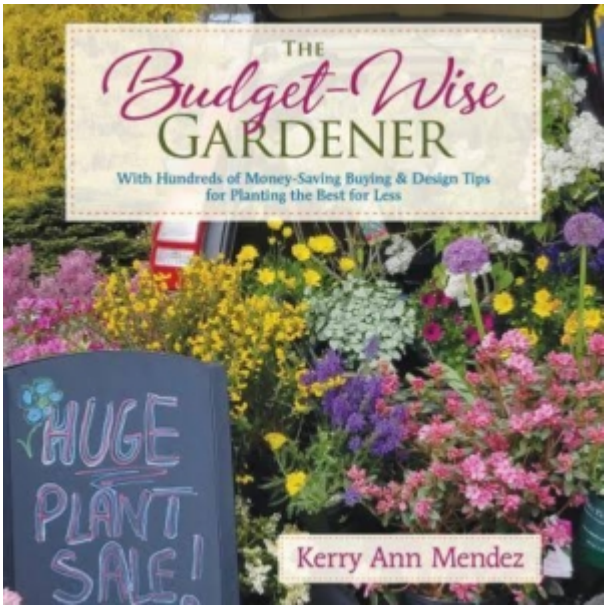
It’s winter, so we gardeners have the time to settle in with a good book.



Here's a book that is bound to inspire: *Big Dreams, Small Garden: A Guide to Creating Something Extraordinary in Your Ordinary Space* by Marianne Willburn, a Master Gardener in the Washington,DC area. The publisher describes the book as follows:

"An ideal guide for those who struggle with limited resources, B*ig Dreams, Small Garden* leads you through the process of visualizing, achieving, maintaining, and enjoying your unfolding garden. It gives you tips for making a sanctuary in less-than-ideal situations and profiles real-life gardeners who have done just that—including the author herself."

Willburn managed to pursue her dream garden during some tumultuous events, including her husband's layoff during an economic downturn. You can hear all about it on this podcast, www.mynspr.org/cultivating-place/conversation-marianne-willburn. Having faced a few obstacles herself, she's bound to be source of encouragement and enthusiasm.



For many of us, budgetary constraints are the obstacle between our dream garden and our reality garden. Here's a book that directly addresses that issue: *The Budget-wise Gardener: With Hundreds of Money-Saving Buying & Design Tips for Planting the Best for Less* by Kerry Anne Mendez.

I've known gardeners for whom the conditions of their site were a major stumbling block. Sometimes you just have to work with what you've got. You may dream of sun-loving flowers, but if your site is shady, you might be better off embracing shade. If that's your situation, take a look at *Glorious Shade: Dazzling Plants, Design Ideas, and Proven Techniques for Your Shady Garden, (*Jenny Rose Carey, 2017). One of the things that attracted me to this book is that the author's own gardening experience is in a region with many similarities to central Virginia — the Philadelphia area. Jenny Rose Carey is the senior director of the Pennsylvania Horticultural Society's Meadowbrook Farm in Jenkintown, Pennsylvania. She previously worked at Temple University as an adjunct professor in the Department of Landscape Architecture and Horticulture and as director of the Ambler Arboretum.

Television Shows

Yes, you read that heading correctly: television shows. Sitting in front of the tube is not something most gardeners would endorse, but I happened upon a BBC television series that I can't wait to start watching. It's called *Big Dreams, Small Spaces,* which follows the efforts of a British garden guru named Monty Don as he consults with homeowners beset by garden issues of all types: poor sites, empty pocketbooks, the consequences of bad choices, and on and on. This makeover show is a little different in a number of ways.

First, Monty Don is a pretty witty guy; his first reaction to one back yard is: “One could make it good, but not using anything that’s here.”

Monty Don with his first big-dream gardeners.

Another difference is that after Monty Don comes up with a plan, the homeowners are left on their own to do the work, thus offering a much more realistic take on the gardening enterprise. Then Monty shows up occasionally to check in on the project — with more witty remarks. When a gardener asks him when is the best time to prune trees, Monty replies, “The simple answer is about six months ago.” The show consists of three seasons’ worth of episodes, and you can binge-watch them all on Netflix, www.netflix.com/bbc/Big Dreams, Small Spaces/80232852/.

Here are a few of the rather discouraging sites that Monty Don has confronted.

A very steep slope

In Season 3, Episode 3, Monty helps a couple with differing ideas about what constitutes a beautiful garden and a father-daughter duo who wish to turn their steeply-sloping yard into a cancer patient retreat.

In another epsisode, the homeowner describes the problem as her ‘concrete driveway’ of a garden.

But this “after” photo shows what’s possible for those who persevere. If Monty Don and his home gardeners do not discourage easily, then I suppose we shouldn’t either.

Podcasts

I figured there’d be a few podcasts aimed at gardeners, but who knew there would be so many? Here are a few that are highly recommended:

In Defense of Plants (www.indefenseofplants.com/podcast) describes itself as a show “designed to cure plant-blindness around the globe.” The introductory matter on the website is so arresting that it seems worth repeating here:

> “It would seem that most people don’t pay any attention to plants unless they are pretty or useful in some way. I reject this reality outright. Plants are everything on this planet. They have this amazing ability to use our nearest star to break apart water and CO2 gas in order to grow and reproduce. From the smallest duckweed to the tallest redwood, the botanical world is full of amazing evolutionary stories. I am here to tell those stories. My name is Matt and I am obsessed with the botanical world. In Defense of Plants is my way of sharing that love with you.”

And a survey of Matt’s recent podcast topics is a veritable cornucopia of intriguing plant stories, including:

"When Palms Grew in Wyoming" (Episode 189, 12/2/2018)

"Demystifying Orchids" (Ep. 179, 9/23/18)

"Pollinator Pathway: A Design Challenge For The Planet" (Ep. 133, 11/5/17)

"Legumes and Their Nitrogen-Fixing Partners" (Ep. 123, 8/27/17)

"Plant Architecture" (Ep. 119, 7/30/17)

Here's the one I'm listening to now: "In Love With Native Plants" (Ep. 187, 11/18/18), in which the host, Matt, meets with Aubree Keurajian who has just recently started her own native plant nursery in Connecticut. She calls her new operation Ungardening: Native Plants and Restoration. Aubree collects seeds in her local area in order to propagate only local natives. She discusses the need to collect seed sparingly or risk wiping out most of a local species. She and Matt then move on to discuss "messy gardening" — a whole new concept to me.

The SodShow (www.sodshow.com), hosted by a Dublin-based garden designer named Peter Donegan, sounds like a lot of fun. Each episode features a chat with a fellow garden professional — including designers, head gardeners at public gardens, and nurserymen and nurserywomen.

A Way to Garden (awaytogarden.com/radio-podcasts) is also an NPR radio show, hosted by Margaret Roach, who gardens in the Hudson River Valley of New York. She's been at this for 10 years, so there are lots of episodes to choose from. The podcast is just one feature on the website, which identifies its focus as "horticultural how-to and woo-woo" and "the source of organic gardening inspiration." Recent episodes include "What I Learned about Pollinators and other Beneficial Insects in 2018," and "Go Ahead, We Dare You: Widen Your Plant Palette, with Andy Brand." You can view a list of episodes at itunes.apple.com/podcast/margaret-roach-a-way-to-garden.

Weathering Weather Woes

I am spending some of my "free" time this winter wondering if next summer will be as hazardous to plants as last summer. If so, is there anything to be done to prevent the weather-related ravages of the summer of 2018?

My research on this topic has not uncovered any sort of silver bullet *(*beyond planting in well-drained containers!), but I did learn a bit about HOW extreme weather causes problems for plants. For example, excessive rain like we had last summer can reduce the amount of oxygen in the soil, resulting in injury to a plant's root. For this reason, drowning plants look like drought victims. Heavy rain can also make plants more susceptible to many fungal diseases, and it can not only damage plants, but also compact soil and cause erosion. Univ.IllinoisExt./How Weather Affects Plants; "Excess Water/Edema- Annuals, Bulbs, Ground covers, Perennials, and Vines," Univ.Md.Extension.

I made one happy discovery: scientists ARE working on how to help gardeners with these problems. Here in America, we have Dr. David Wolfe, a Cornell professor of horticulture and a leading authority on the effects of climate change and rising atmospheric carbon dioxide on plants, soils, and ecosystems. Dr. Wolfe's advice for gardeners is contained in a chapter titled "Gardening Sustainably in a Changing Climate," found in the book *The New American Landscape*: *Leading Voices on the Future of Sustainable Gardening* (2011). Sadly, this book is no longer in print, but his advice is summarized on the website of the Cornell Botanic Gardens, "Advice to Gardeners from a Climate Change Expert," www.cornellbotanicgardens.org.

What to do about the excessive water problem? One thing that's recommended is to locate any low spots in your gardens where water tends to pool in heavy rain; then try to improve drainage from these areas. This sounds difficult to accomplish in the average garden bed. But you can also improve drainage with soil amendments, such as compost, and that's quite do-able.

And what about the early spring frost that comes along after a lengthy warm period and destroys the buds of those flowers you were looking forward to? One solution is to avoid planting on north-facing slopes and low-lying shaded areas that are more susceptible to frosts. Planting on the south side of a wall may help by reflecting the sun's heat sooner in the day. For plants whose blooms we treasure, we may need to start keeping a supply of "frost blankets" on hand, too.

Learning about these books, shows, and other resources has definitely heightened my enthusiasm for the next growing season. If you have other recommendations, I hope you'll add them in the comment section below. Happy New Year!

January Tasks & Tips in the Ornamental Garden

By Cathy Caldwell | January 2019-Vol.5 No.1

Is there really anything to do in the ornamental garden in January? Well, there ARE a few things.

Keep an eye on your trees and shrubs. After a heavy snow, limbs can be damaged by that accumulated snow, so brush it off. This is a good time to cut down injured or dying trees, but only if you were able to observe the injury or death BEFORE winter began. Watch for winter and snow damage and be ready to prune right BEFORE spring growth begins. But don't rush into deciding that a limb or branch has died; some plants will leaf out late, so it's best to wait for spring growth to decide on what needs to be pruned out. Also, many plants have protective mechanisms that may appear to be damage, but are not. See more about this and other hazards of winter in this article, "Managing Winter Injury to Trees and Shrubs," Va.Coop.Ext.Pub.No.426-500.

Survey your perennials for frost-heaving. The freeze-thaw cycle can push the crowns of perennials or other shallow-rooted plants up out of the ground, especially if your beds are not mulched. Take regular tours of your garden to keep an eye out for this. Be gentle in pushing them back into the ground and cover with mulch or evergreen boughs to protect them from more of this damaging heaving.

Don't forget your fall transplants. Fall is a great time to plant trees, shrubs and perennials, and that's just what I did. If you did also, don't forget that they may need to be watered if we have a dry spell. So far our winter has been very moist, but if that changes, we'll actually need to get out there and do some

watering.

January is good time to do some garden planning and dreaming. With all the leaves gone, the bones of your garden are fully revealed. The bones are the woody structures and evergreens that provide the backdrop for your perennials, bulbs, vines, and ornamental grasses. Perhaps, like me, you see the need to re-design or renovate your existing beds. You can use this time to study potential trees and shrubs to be planted later.

Speaking of renovation, if that's something you're planning to tackle soon, you might want to take a tip from Cathy Clary, a well-known and much-admired garden consultant in Albemarle County. Cathy recommends the book *Landscape Rejuvenation: Remodeling the Home Landscape* by Bonnie Appleton. I found a copy in the library, and on the next snowy, frigid day, you'll find me curled up before the fire with this book. But I promise to return it to the library, so you can check it out, too.

SOURCES:

"The Effects of Cold Weather and Snow on Landscape Plants," culpeper.ext.vt.edu/successful-gardening-through-extension-newsletters

Garden Basics Classes, the PLA Seminar, and more!

By Cathy Caldwell | January 2019-Vol.5 No.1

January 12 — Garden Basics: Gardening Tools and Tips
January 12 @ 2:00 pm – 4:00 pm
Trinity Episcopal Church, 1118 Preston Avenue
Charlottesville, 22903 + Google Map
Make gardening simpler, safer and more effective with proper tools and practices.

Find out more »

February 7, 2019 — Piedmont Landscape Association Annual Seminar

Every February the Piedmont Landscape Association hosts an annual seminar. As the PLA describes it, the purpose of the seminar is “to bring gardening enthusiasts and landscape professionals together in an

educational setting."

For a detailed list of speakers and topics, plus registration information, go to www.piedmontlandscape.org/seminar-2019. The seminar is an all-day affair at the Paramount Theater, www.theparamount.2019-piedmont-landscape-association-annual-seminar.

February 16, 2019 — Garden Basics: Soil, Mulch and Compost
February 16 @ 2:00 pm – 4:00 pm
Trinity Episcopal Church, 1118 Preston Avenue
Charlottesville, 22903 + Google Map
A successful garden begins with healthy soil. Learn how soil works and how to make yours work better.

Find out more »

Shenandoah Valley Plant Symposium 2019 — Friday, March 15, 2019

Best Western Inn & Conference Center, Waynesboro

8:00 a.m. to 4:15 p.m.

Regular Registration- $90 per person

For more information, go to www.waynesboro.va.us/971/Shenandoah-Valley-Plant-Symposium

Piedmont Master Gardeners Spring Lecture Series

Mark your calendar now! The first of these popular lectures is in March. Here's the schedule:

Thursday, March 14 – Alex Niemiera, Virginia Tech School of Plant and Environmental Sciences presents "Gems in the Garden: Tree Characteristics that Add Grace to Your Landscape."

Thursday, March 21 – Janet Davis, Hill House Farm and Nursery presents "Native Plants for Harmonious Gardens."

Thursday, March 28 – Adria Bordas, Virginia Cooperative Extension, Fairfax County presents "Tips for Keeping Your Vegetable Garden Pest and Pesticide Free."

Thursday, April 4 – Steve and Karen McCurdy, Butterfly Society of Virginia present "The Mysteries of the Marvelous Monarch."

All lectures are held from 7 p.m. to 8:30 p.m., in room A of the Albemarle County Office building on 5th Street Extended, just off I-64 in Charlottesville, Virginia. Cost to attend is $8; reserve a place online at pmgarchives.com/events beginning the 14th of February or purchase at the door.

DIY RED WINE VINEGAR

By Cleve Campbell | January 2019-Vol.5 No.1

There are three reasons to make red wine vinegar: taste, taste, and taste. And there's a possible fourth reason: it's so easy. Some culinary folks suggest that turning wine into vinegar is a good way to use leftover wine from dinner or a party. Leftover wine is an oxymoron; that doesn't happen in my abode. So unfortunately, I have to start with a full bottle — less a glass, which is required, of course, to ensure quality. Homemade red wine vinegar is more delicate and has more complex flavors than mass-produced commercial

vinegars. A good red wine vinegar is just hard to find in the supermarket.

The process of turning wine into vinegar is simple. The goal is to turn the alcohol and sugars in the wine into acetic acid by inducing oxygen and acidic bacteria or "Mother of Vinegar" into the wine. Here's all you need to accomplish this magical feat:

- **Find the Mother of Vinegar.** Local wine- and beer-making shops often stock mother of vinegar, and there are numerous online suppliers, or better yet, snag some from a friend. A mother of vinegar is a slimy, gelatinous blob that encourages fermentation. If you have bought a bottle of raw apple cider vinegar, you've probably seen a leftover mother floating in the bottom of the jar. The cool thing about mothers is that during the process, they give birth to other mothers, which can be used for future batches of vinegar. The main thing about mothers are they are specific; if you are making red wine vinegar, it requires a mother specifically for red wine; likewise, white wine vinegar requires a mother specifically for white wine while a specific malt mother is required to make malt vinegar.
- **A gallon or half-gallon glass or ceramic container** with a wide mouth. Plastic containers are not recommended as plastic can interact with the vinegar. Yes, you're right, commercial vinegar often is packaged in plastic containers; perhaps that is part of the quality issue.
- **Cheesecloth and a rubber band**.
- **Patience!** The process takes about 2 months from start to finish.

Ingredients:

- 2 parts red wine
- 1 part water
- 1 part mother of vinegar

Process:

- **Clean the container**, be sure to rinse thoroughly, invert and let dry.
- **Add red wine to container**,
- **Add water**
- **Add Mother of Vinegar,** which jump-starts the fermentation. The container should only be filled to 2/3 to 3/4 capacity to provide surface area for oxygen to feed the mother.
- **Cover container with cheesecloth or other cloth and secure with a rubber band.**

Store the container in a dark, warm area; ideally, the temperature should be between 70-80º F. If you don't have a dark area, you can cover the container with paper or cloth to keep the light out, but don't cover the top because you want to allow the mixture to breath.

In a week or so a thin web-like veil will form on the surface. That's a good thing; it means the mother is doing her job.

Feed the mother ever week or so with a cup of wine. When you are taking a sample to taste or adding wine, gently move the mother aside.

When is it done? The real test is when the vinegar tastes good. Then strain it through a coffee filter to remove any sediment and store it in an airtight sterilized glass bottle. You can also keep the vinegar in the original container and simply take what you need straight from the crock, while continuing to add wine

(about a cup or so a week) to keep the vinegar going.

Bacteria in the vinegar container will multiply over time, creating new mothers that will be floating around. Old mothers will sink to the bottom over time and will take up room at the bottom of the container. They will have a sponge-like appearance and can be fished out carefully to provide space for more vinegar.

Once started, this process can be maintained for years by simply adding wine and occasionally cleaning out the mother from the bottom of the container.

Aged wine vinegar has a tawny reddish color, a clean but sharp aroma, and a subtly intense flavor. Red wine vinegars are a ubiquitous ingredient in salad dressings, stews or slow-roasted dishes.

Caution: don't get carried away with vinegar madness or you'll be bottling your tasty vinegar in adorable vintage bottles and selling it at the local farmers' and flea markets.

Enjoy!

Adapted from: "How to Make your own Red Wine Vinegar," *Bon Appetit*, January 31, 2013. **www.bonappetit.com//how-to-make-your-own-red-wine-vinegar**