Cultivating Food Nature's Way

By Mike Fillon, Master Gardener What the heck are organics, permaculture and sustainability?



What do these trendy buzz words mean?

I prefer a different word...



Nature's Way

(Source: Landscape Architects Network)

Applying simple principals can impact –

- Your vegetable garden
- Your yard
- Your trees
- Your neighborhood
- and, at the risk of sounding overly dramatic,
- your planet

There's one indisputable rule everyone plants something for food or enjoyment must recognize

Nature ALWAYS prevails...

Healthy squash

Squash beetle...





.... hubris never wins.

Organically grown peach

Brown rot fungus





So relax....

.... Why fight it?



Nature's Way:

Fruits, vegetables and herbs are grown without the use of -

- synthetic pesticides, herbicides, or fertilizers.
- sewage sludge or
- genetically modified organisms, or ionizing radiation.

Nature's Way is a system of agricultural principles that simulate natural ecosystems.

• You, know Nature!

• It simulates nature by obeying its rules.

• It's really that simple

• ... and easy.

Ideally, the results are agricultural ecosystems that meet the needs of the present without compromising **the ability of future generations** to meet their needs. • Survival of the fittest is a myth....

Instead it's survival of the adequate...



• Like all living things, plants have basic needs:

Nutrition Water Appropriate sunlight To Reproduce



- Nutrition
- Water
- Appropriate sunlight
- Air circulation
- Reproduction

All plants have a will to survive....





They don't want to be coddled



Here's a couple of things you might not want to hear....



(GULP!) Most rectangular vegetable garden plots are NOT normal...



Plant- Good companions – Bad Companions



Highly recommended!

Most fruit orchards are not normal...



Predators FEAST on monocultures



- Nature doesn't plant trees in straight lines, or concentric circles.
- (Only we do!)

No one sprays or fertilizes the forest...



Instead; let's bring the lessons of the forest into our yards...

All about me, ME, ME!!!

I'm a professional science and health writer; and....

a long time fruit tree planter.

Volunteered at Henderson Park native plant project, and then enrolled in Master Gardener Program.

- The Tucker Orchard Guild (TOG)
- Has planted nearly 400 fruit trees and bushes in the Tucker area over the past 4 years at
- Schools
- In our parks
- At businesses



Sometimes we have surprise guests...



A life altering experience...




First, a few things you might not know:



There are more living organisms in a teaspoon of soil than all the humans on Earth.



Oak tree DNA shares the same building blocks as humans, has similar gene structure and may encode for some proteins that are similar to humans. We have a 60% genetic similarity with banana plants.



 Many of the "housekeeping" genes that are necessary for basic cellular function, such as for replicating DNA, controlling the cell cycle, and helping cells divide are shared between many plants (including bananas) and animals.

Fruit fly?

Also 60 percent identical

Secret Lite of Plants A Fascinating Account of the Physical, **Emotional, and Spiritual Relations**

1979 book by Peter Tompkins and Christopher Bird : A fun read, but with bizarre claims with anemic scientific evidence...

By Daniel Chamovitz, Ph.D., Director of the Manna Center for Plant Biosciences at Tel Aviv University.

The science behind how a plant senses and adapts to its environment. (2012.)



Unlike animals, which can move to search for food, shelter or a mate, plants are confined to one spot.

In fact, their lack of movement **heightens** their defense systems.

• "Because of this," writes Chamovitz, "plants have evolved complex sensory and regulatory systems that allow them to modulate their growth in response to ever-changing conditions." When leaf-eating insects attack a plant, the affected plant emits volatile chemicals into the air. Through "smell," this effectively warns neighboring trees of a possible attack.

(NOTE: Elevated CO2 impairs a key component of the plant's defenses against leafeating insects)



Here's another interesting fact ...



According to *The Hidden Life of Trees: How they Feel, How They Communicate,* by German botanist and forester Peter Wohllegen, the forest is a social network

- Wohllegen describes how trees are like human families:
- Tree "parents" live together with their children,
- Communicate with them,
- Support them as they grow,
- Share nutrients with those who are sick or struggling, and
- Even warn each other of impending dangers.



After reading this book, you may never view trees and their forests the same again.



• And- hopefully- how you think about and treat the fruit trees in your yard.

• So what fruits should you plant?

• Here's a few that I can recommend because they're relatively easy:

Let's here it for Blueberries!

Possibly, the easiest thing to plant here are rabbiteye blueberry bushes. Georgia recently became the number one blueberry producing state.

They are so easy to grow and care for, I call them the "Golden Retriever" of fruit.



American elderberry

The American elderberry (Sambucus canadensis) is a large shrub that produces white flowers in the spring and large clusters of small, black fruit in late summer. The tree is drought hardy, winter hardy and attractive during blooming and fruiting. The small berries may be eaten raw when fully ripe or made into jelly, pies or wine.



The feijoa or pineapple guava

The feijoa or pineapple

guava (Feijoa sellowiana) is a small, evergreen tree with attractive flowers and whitishbacked leaves. The plant is hardy to about 14 degrees F.

Severe freezes will kill the plant to the soil line, but it will regrow rapidly the following summer.

Feijoas bloom in late spring and ripen in the fall. The petals are sweet, and many people enjoy them as much as the fruit.



Serviceberry (or Juneberry)

Serviceberry bushes and trees are considered native.

The fruit ripens in June and is slightly sweet and juicy. Birds love 'em so pick them quickly!



Medlar

The medlar (Mesphilus germanica) is a small shrub-like tree in the rose family. Large, white blossoms appear in the spring and develop into small russet brown fruit, which are hard and acidic.

The fruit are harvested after a light frost..

It has a hard shell which deters many pests and animals.



Mulberry

Mulberries are large, fast-growing trees that are good fruit producers for humans and wildlife. The fruit resembles a slender blackberry and have a mild flavor.

There are usually few problems with plant hardiness in Georgia's climate.

You can often find them in the wild (where they stain the ground purple!).



Native plums

Grown as large shrubs or small trees, American wild or native plum trees (Prunus americana) thrive in full sunlight and fast draining, light, slightly dry soils.

Just as their natural appearance and growth habit suggests, American wild plums require minimal maintenance.

There are a variety of native plum trees, including Roadside and my favorite; Chickasaw.



Persimmon

The native persimmon (Diospyros virginiana) is a small tree, but may often reach a height of 40 to 50 feet.

The fruit color is usually orange, ranging to black, and the skin usually has a heavy waxy bloom. **Warning;** the fruit is HIGHLY astringent before it's ripe, usually around Halloween.

There are other – <u>non astringent</u>varieties not considered native, but are just as easy to grow and non-invasive. We've planted both kinds; American and Asian.





There are native persimmon trees on Cowan Road in Tucker. We, along with our friends from Concrete Jungle, harvested these trees last fall and gave the delicious fruit to local food banks.

Now about those Pawpaws...

Our area is resplendent with wild, native pawpaw trees. We have discover dozens in Brook Run, Henderson Park, Johns Homestead and Cofer Park in Tucker, as well as many other parks in the Atlanta area with bodies of water nearby

Usually you can spot a small grouping of seedlings. These are usually spurs off a small number of mother plants; meaning, because they are of the same species, they won't cross pollinate.



Pawpaw tree at Tucker Rec



Flower on Tucker Rec Pawpaw



Pawpaws a plenty

If we get proficient at finding and pollinating enough wild pawpaws, our ultimate goal is to offer pawpaws to everyone who would love to have these unique fruit trees in their front yards.

They rare very easy to propagate from seeds.



- Other good fruit choices:
- Pears (Asian or domestic- NEVER Bradford)
- Raspberries
- Blackberries
- gooseberries
- Currants
- Goumis
- Sseaberries & lingonberries

TOG is involved in an experiment tackling a vexing disease and insect issue ...



The Peach Pit. (Before)

- Now home to –
- 25 Peach trees
 2 Nectarine trees
 1 Apricot tree

The soil at the site is hard clay and fairly sterile with very little microbial and fungi activity.

Lead designer of the site, Jessica "Digger" Thompson (below in green shirt) has accumulated companion plants – **and still hoping for more-** that will help the fruit trees ward off harmful insects, other predators and disease, while strengthening the trees inherent defense system through help from the "**Wood Wide Web.**"












Peaches with brown-rot fungus

If you've ever tried growing them, you know peaches are difficult to grow here organically because of a range of pests and diseases – at least partially from over-domestication that has weakened their natural defenses.

The **Peach Pit** is part of a study investigating the main peach tree diseases, including brown rot (Above) and plum curculio (below.)

Plum Curculio





• How are we doing?

• We're making progress but the challenges are immense.

The Tucker Orchard Guild's Planting Beliefs & Guidelines

(Or, what the chemical companies don't want you to know!)

There are three parts of this:

- Companion planting, including fruit tree guilds. (Or, what the forests can teach us.)
- Building the best soil money <u>can't</u> buy
- Putting insects to work.

For soil building, there are two major thrusts:

- "Wood- Wide" Web
- Soil Food Web

Good nutrition begins in healthy soils:

The issue of endocrine disruption pesticides and other, should be of greater concern to our health.

(We are what we eat, eats!)

One example of this is **the herbicide glyphosate**, easily the most widely used herbicide in the world,.

The World Health Organization has classified it as a probable carcinogen due to its endocrine disrupting properties and studies indicating a link between exposure and certain types of cancer.

We want living soil, NOT dead dirt.

The four main problems with synthetic fertilizers:

When in doubt, get a UGA /DeKalb County soil test.

 Your results will tell you what nutrients are available in your soil and at what quantities (low, medium or high).



- UGA will also test your soil for harmful metals (tests S13, S17, S42),
- pesticides (tests S44– S47), organic solvents (test S49), and petroleum compounds (tests S51 and S52).
- The one on left is \$150.

- **Priority Pollutants** By ICP-AVOES
- Antimony (Sb)
- Arsenic (As)
- Beryllium (Be)
- Cadmium (Cd)
- Chromium (Cr)
- Copper (Cu)
- Lead (Pb)
- Nickel (Ni)
- Selenium (Se)
- Silver (Ag)
- Thallium (Tl)
- Zinc (Zn)

1. Pollution and leaching

The salts they contain leach from the soil into groundwater, and end up in rivers and lakes.

The extra nitrogen washing out of urban soils into the water cause algae blooms, which suffocate fish and other aquatic animals.



Always keep your trees, at least for the first three years, well protected with compost & mulch.



• Avoid manure - unless you know it's source. (Again, just as YOU are what you eat eats, the same is true for your fertilizer!) The same is true for straw.

Check its source; make sure it hasn't be sprayed with toxic pesticides and herbicides.

2. Synthetics do not "feed the soil"

... and drive off beneficial insects.

The result is a steady decline in the overall health of gardens.

Weeds and pests become more prevalent. This results in a steady download cycle of greater fertilizer and herbicide treatments.

NOTE: DO NOT CONFUSE weeds with groundcovers and other nitrogen fixers including clover!





3. Your plants form a chemical dependency –

Since nutrients are so readily available, your garden plants and lawn have no need to grow strong roots in their search for nutrients. With a stunted root system, they are less resistant to weeds and pests, forcing the constant use of pesticides.

4. Many all-purpose fertilizers only consist of the 3 main nutrients

Plants need a variety of micronutrients along with the basic NPK nutrients. Calcium, boron, magnesium, copper, iron are examples of other trace nutrients. Though your plants need them in much smaller amounts, over time chemicallytreated soils will become deficient in them.

What are Fruit Tree Guilds? (Applies to vegetables, also)

Fruit tree guilds are complementary plants – with distinct roles- surrounding a single or cluster of fruit trees emulating the symbiotic relationships that exist between plants in nature.

Each plant benefits others in the vicinity, interact with animals and soil microorganisms to create an ecosystem.

A fruit tree or trees are surrounded

by:

Suppressors:

A circle of bulbs underneath the drip line subdue grass growth which competes with the fruit tree and the surrounding plants for nutrients. Alliums such as chives, leeks and garlic are good choices. The best plant is the daffodil, because they deter deer and rabbits which find them poisonous.







"Attractors"

Dill, <u>fennel</u> and coriander: These attract a beneficial variety of insects to the guild; some help pollinate the plants, while others prevent damaging species of insect from becoming a problem.



Repelers

Besides attracting predators, these plants **repel potentially damaging insects**. <u>Nasturtiums</u> are best for this function; and many commercial apple orchards plant them around the base of the trees to help protect their crops.

Mulchers

These plants **naturally provide mulch** to the guild by leaving on the ground to rot into the topsoil.providing nutrients that all the plants in the guild can access. Comfrey, artichokes and rhubarb all work well as mulchers.



Accumulators

These plants increase the nutrient content of the soil. Like the mulching plants, this lessens the need for manually adding nutrients by sending roots deep down into the soil and bringing up nutrients such as calcium, potassium and sulfur to be used by the fruit tree and other guild members. Yarrow, chicory and dandelions perform this function.





Fixers

Besides the nutrients added by the accumulators, **these plants add the best form of nitrogen in the soil.** Leguminous plants have special nodules on their roots that form a symbiotic relationship with certain soil bacteria to help 'fix' nitrogen. <u>Clover, hairy vetch</u>, peas, beans and alfalfa are all regarded as fine nitrogen-fixers.







There's an eight element. Anyone know what this is?

One type of fungi, called mycorrhizal fungi, physically attaches to the roots of woody plants and extend the 'reach' of the plant's roots, mining for water and nutrients in the soil that plants have a hard time accessing with their own roots alone.



The "Wood-Wide Web"

Called **mycelium**, this fungi network is more efficient at gathering water and nutrients than a plant's roots are by themselves.



The fungi feed the woody plants with the nutrients and water that it has extracted from the soil, and the woody plants feed the fungi food sugars it has produced via photosynthesis, which the fungi cannot produce itself.



The Fungal Curve

(SOURCE: *The Holistic Orchard*, by Michael Phillips)



The Fungal Curve

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Fungal disease spores arise from the ground surface to infect tender fruit tissues. (Red Curve)

Beneficial fungi and bacteria also arise and establish on the foliar surface. (Green)







Relationships between soil food web, plants, organic matter, and birds and mammals

Fungi are an integral part of what's known as "The Soil Food Web." Fungi and bacteria are both decomposers in the soil, they <u>degrade plant residues</u> <u>differently</u> and have <u>different roles</u> in the recycling of nutrients. This is why we use cardboard when we plant fruit trees- and why we add wood chips, mulch and compost;

It's because we want a fungal dominant soil. We want a soil that's full of the beneficial fungi that help <u>woody plants grow vibrantly and</u> resiliently, and, aid, we hope, in inter-tree communication.


However; This can get tricky...

There's **beneficial** fungi....

.... And also **pathological** fungi.

We want one but not the other!

- Tips to prevent bad fungi:
- Sunlight is the best disinfectant
- Air circulation
- Active mycelium network to overpower root entry.

Each, according to its needs...



Peach, nectarine, Japanese plum & apricot.



Apple, pear and cherry.







 Our body's own remedy- the immune systemis far more powerful that any medicine we have devised." Dr. Daniel M. Davis, The Beautiful Cure, The Revolution in Immunology and What it Means for Your Health Plants also possess a range of active defense abilities that respond to pathogens – such as bacteria and fungi- and parasites, from microscopic viruses to phytophagous insect. While plants don't have white blood cells and other immune system traits like animals, they do respond via systemic acquired resistance (SAR) and induced systemic resistance (ISR)similar to our ability, in a sense, to "learn" and adapt...

The Soil Food Web

This is the work of "soil pioneer" Dr. Elaine Ingram, from Oregon State University:

"Our soil teams" with a multitude of organisms which provide the necessary work for *healthy plants to* grow free from disease, ...pests, and infertility...



"... these interconnected interactions and feeding relationships (quite literally "who eat who") help determine the types of nutrients present in soil, its depth, and pH, and even the types of plants which can grow."



Putting Insects to Work

 Plants under attack by herbivores (vegetativeeating insects), send out chemical signals knows as herbivore-induced plant volatiles (HIPV.) These signals are received by carnivorous insects- telling them a plant is under attack and, by the way, as a meateater, you'll find the attackers delicious.



It's estimated that at any given time, there are 1,000 different types of insects in the typical backyard. What percent do you think cause the most damage to our plants?

Only three percent....

This means that **when we spray** to kill insects we also risk killing the beneficial and harmless ones, leaving more room for infestations of the bad bugs, throwing that natural balance out of whack... Here are some our the friends you'd like to attract....

Assassin Bug

Lady Bug



Praying Mantis

Big-eyed bug (Geocoris)





• How do you attract beneficial insects?

By planting the pollinators they like (in addition to their carnivorous bug-meals!)

Alfalfa



Crimson Clover



Other tips

- DO NOT TILL:
- Only disturb the soil as much as necessary.

 According to the book, Weedless Gardening by Lee Reich, there are 140 weed seeds buried in each pound of soil.

Many weeds are NOT weeds:

• Clover is a great nitrogen fixer.

 Dandelions mine minerals deep in clay soil and bring them to the surface If you stake a plant, keep it loose, and only for a year.

- To develop girth, trees need to "Sway."
- Labels that surround a tree MUST be removed before they choke off nutrition.

Battling biting ants?

• Spreading coffee grounds will drive them away.

Birds getting most of your berries?

Reflective tape attached to the branches might help. (It works for me!)



Squirrels nabbing all your fruit?

This works for me.



While many people think organics, permaculture, sustainability and other "granola" ideas are too time consuming, and require back breaking work - even with the acknowledged benefits- if we let nature do their part (by cooperating with her!) ultimately it ends up being a lot less work.

And that's not a quote from Dr. Ingham-

That one's from me!



So; what do organics, permaculture and sustainability mean???



they mean ensuring a bountiful planet for future generations...

IF YOU WANT TO CHANGE THE WORLD...



GROW THEIR OWN FOOD.

• Nature's Way.

 The Tucker Orchard Guild has two interns from the Tucker High School branch of the Earth Tomorrow Club (National Wilderness Federation) They were featured in *Up-Close and Personal – Tucker* magazine.

They will be speaking on the club's activities and permaculture for the future of the planet on March 25 at 6 PM to the DeKalb Master Gardener Association at the Northlake Library on Lavista Road.

Visitors are welcome and attendance is free.



The Tucker Orchard Guild has provided them with three books – that we HIGHLY recommend:



REGENERATIVE PRACTICES FOR THE FARM, GARDER, DECHARD, FOREST, AND LANDSCAPE

Aycorrhizal Planet

How Symbiotic Fungi Work with Roots to Support Plant Health and Build Soil Fertility

MICHAEL PHILLIPS

attracting beneficial bugs

a natural approach to pest control

garden

marrier (

jessica walliser author of good bug, bod bug

Thanks for listening!

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www.dcgo.org Facebook: Friends of Tucker Parks' Orchard Guild Website: tuckerorchardguild.org/
These are the books I reference most often:

Farming the Woods: An Integrated Permaculture Approach to Growing Food and Medicinals in Temperate Forests. Ken Mudge & Steve Gabriel (2014)

The Hidden Life of Trees; What They Feel, How They Communicate. Peter Wohlleben, 2016.

The Holistic Orchard: Tree Fruits and Berries the Biological Way; Michael Phillips (2012)

The Mix & Match Guide to Companion Planting; Josie Jeffery. (2014) *Mycelium Running: How Mushrooms Can Help Save the World;* Paul Stamets. (2005)

Pawpaw: In Search of America's Forgotten Fruit; Andrew Moore (2016)

Teaming with Fungi The Organic Gardener's Guide to Mycorrhizae; Jeff Lowenfels & Wayne Lewis. (2017)

What a Plant Knows; A Field Guide to the Senses; Daniel Chamovitz, 2012.

What I'm using to Grow Organically

1. Compost and hard wood chips- build trees natural defense systems

2. Foliar spray: Neem Oil

3. Foliar spray: Serenade fungicide (**Bacillus subtilis strain QST 7**)

4. Soil & root drench (Dunwoody): BT-

(Bacillus Thuringiensis) Thuricide

5. Beneficial nematodes: Home orchard

- 6. Milky spores
- 7. Spinosad
- 8. Insecticidal soaps
- 9. Garlic Barrier

Bacillus subtilis (Serenade)

• **Bacillus subtilis**, known also as the **hay bacillus** or **grass bacillus** IS used as a fungicide. The bacteria colonize the root system, leaving no room for fungal disease organisms. It is also being used to produce insect toxins, including one to kill malarial mosquito larvae.

According to a Toxic Substances Control Act report from the Environmental Protection Agency, Bacillus subtilis "is considered a **benign organism as it does not possess traits that cause disease**. It is not considered pathogenic or toxigenic to humans, animals, or plants. The potential risk associated with the use of this bacterium in fermentation facilities is low."

• Not harmful to honey bees.

Serenade & Bees: A 2004 study appearing in the journal Biological Control, "Effectiveness of honey *bees* in delivering the biocontrol agent *Bacillus subtilis* to blueberry flowers to suppress mummy berry disease."

In other words, it is used to help fight diseases on blueberries!

BT (Bacillus Thuringiensis) and Bees

Normal exposure rates do not cause harm to honey bees. Very high concentrations (108 spores/ ml sucrose syrup) of B.t. var. tenebrionis, which is used against beetles such as the Colorado potato beetle, reduced longevity of honey bee adults but did not cause disease

Neem Oil and Bees

http://npic.orst.edu/factsheets/nee mgen.html

Neem oil is practically non-toxic to birds, mammals, **bees** and plants. **Neem oil** is slightly toxic to fish and other aquatic organisms. Azadirachtin, a component of **neem oil**, is moderately toxic to fish and other aquatic animals. It is important to remember that insects must eat the treated plant to be killed. Spinosad is highly toxic to foraging bees.

Spinosad does not kill adult insects. It kills in the larval stage.

One other thing:

BT is used in GMO Crops (BT Corn.) When this happens, a gene from BT is inserted in Monsanto's pesticide product to fight insects, creating a completely unique and toxic product. These are NOT the same thing as what I'm using.

Also, I avoid spraying ANYTHING from bud break to petal drop.

Beneficial nematodes

Nematodes are found in soils all over the world.

Beneficial nematodes help control cutworms, fleas, ants, termites, grubs, and other pests. <u>They're carnivores!</u>

The nematodes that damage vegetable plants are plant parasitic nematodes.

Here are a number of different kinds. Here are two you can buy:

Heterorhabditis Bacteriophora (HB) and Steinernema Carpocapsae (SC) Nematodes Mixed.

10 Million nematodes, Garden Size: will treat up to 3,200 sq.ft.

50 Million nematodes treat up to 1/2 Acre. 100 million nematodes treat up to an acre.

Are most effective against Japanese Beetles, Grubs, Weevils, and many other target pests in lawn and garden. They burrow down in the soil to a depth of 7", have shown superior host-seeking abilities in looking for deep soildwelling pests.

