Easy to work and simple to water, sandy soils are usually a gardener’s delight, but there often are sinister enemies lurking within the spaces of these larger grained soils that can cause damage to plants.

Nematodes are microscopic round worms that live almost exclusively in sandy soils because they are too large to squeeze into the spaces between particles of silt and clay, but the larger spaces between sand grains in sandy soils are just right. For many nematodes, plants are a favorite host.

Plant-feeding nematodes can cause severe damage to turfgrass, garden vegetables and decorative flowers, as well as trees and shrubs. Because nematodes are hidden from sight, much of the damage they cause either goes unnoticed or is blamed on insects or some other problem. If you are gardening in sandy soils, nematodes may be a problem.

Nematodes that attack plants are tiny worms, ranging from 1/100 to 1/8 inch in length. Longer than they are wide and round in shape, these cylindrical-shaped animals can be seen with a standard spotting microscope. The bodies of nematodes taper towards the head and tail in most species.

Please do not confuse plant parasitic nematodes with the beneficial and friendly earthworm which does not in any way harm plants. Regular earthworms feed on nutrients in the soil and leave a loose and airy soil behind that greatly benefits plant roots. Nematodes are a type of worm that is completely unrelated to the earthworm.

Nematodes feed on living plant tissues. All have some form of oral stylet or spear, which is used somewhat like a hypodermic needle to puncture the host cell wall. Many plant nematodes inject enzymes into the host cell before feeding. These enzymes partially digest the cell contents before they are sucked into the gut of the nematode. Most of the injury that nematodes cause to plants is related in some way to the feeding process.

Nematodes reproduce by eggs, similar to insects. The number of eggs deposited by a female varies among species and is affected by their habitat. Most species produce between 50 and 500 eggs, but a few occasionally produce several thousand eggs per female. When soil temperatures are in the 80s, many plant nematodes complete their life cycle in about 30 days.

### Plant Parasitic Nematodes...continued on page 2

<table>
<thead>
<tr>
<th>In This Issue</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plant Parasitic Nematodes</strong></td>
<td>1</td>
</tr>
<tr>
<td>Should I Prune My Citrus Tree</td>
<td>3</td>
</tr>
<tr>
<td>Organic Weed Control</td>
<td>5</td>
</tr>
<tr>
<td>Winter Landscaping Tasks</td>
<td>7</td>
</tr>
</tbody>
</table>
Important garden and landscape nematodes include the root-knot nematode, the lesion nematode, the stunt nematode and the foliar nematode. The most common and devastating by far for local gardens is the root-knot nematode.

The root-knot nematode female after mating invadest the tissues of a host plant root and burrows in where she will complete her life. Once she is inside the root tissues, she will not reemerge. Eggs are laid inside the plant where they hatch. Young nematodes then exit the plant tissue into the soil to begin their life cycle.

Plant response to root-knot nematodes is dramatic. Infested roots swell and distort and lose root hairs. This restricts the plant’s ability to take up water and nutrients. Above ground plant parts are usually stunted, slow-growing and unthrift, often showing nutrient deficiency symptoms. If a plant is growing in sandy soil and not doing well, check the roots for sign of nematode damage. Plants that are especially susceptible include tomatoes, eggplant and cotton.

The amount of damage caused by nematodes is dependent upon the actual numbers found in position to attack plant roots. Most plants can tolerate some feeding by nematodes, but heavy infestations, or nematodes feeding upon plants that are already stressed or damaged by other factors could seriously damage or kill the plant. Nematode populations build up over time so it may be years before they reach a problem level.

Solving a nematode problem is not easy. Soil fumigants are sometimes used in commercial fields, but are not available for use in the home garden. Fumigants are highly toxic and can only be used by those licensed to apply them. In addition, they will damage roots of existing plants and they are harmful to beneficial animals in the soil, such as earthworms.

Standard insecticides will not work on nematodes so spraying the soil or drenching with a liquid insecticide such as malathion is definitely not a good idea. Not only is it a waste of money, it is harmful to the environment.

There are two techniques that will provide some relief. One is to make sure that bedding plants and tender garden plants are rotated every year. Do not, for example, plant tomatoes in the same place each season. In some cases it may be important to fallow, or leave bare, a certain segment of the garden during a growing season. If there are no roots of susceptible host plants to feed on, the population of nematodes will decline.

Another useful technique is solar solarization. Soak the garden well with a hose or drip system, then cover the entire area with heavy duty, clear plastic. Seal the edges with soil and let the plastic remain in place during the hot summer months. The high temperatures generated by the sun will kill out any nematodes living within 6 inches of the surface of the soil. It is not a perfect and final solution, but it can help reclaim a soil with high nematode populations.

If you have a sandy gardening soil and your plants are not performing as well as you would expect, perhaps the problem may be the little understood, but highly efficient plant parasitic nematode.
One of the nice things about growing a citrus tree is that it almost always requires very little pruning.

Unlike deciduous fruit trees such as peaches, apricots, and apples, citrus do not need to be pruned annually to ensure good fruit production and tree health. Peaches, for example, need to have almost 80% of each year’s growth removed in order to maintain full productivity of the tree and to avoid the breaking of branches because of a too-heavy fruit load. Citrus varieties have no such requirement because their branches are stronger and more flexible than some of the harder-wooded and more brittle deciduous trees. This allows them to carry a heavy load without breaking.

Citrus trees bear their fruit at the tips of branches while other fruit varieties usually set fruit all along the branch. Pruning of deciduous trees forces the setting of fruit back onto the larger and stronger branches found deeper in the tree canopy. This process helps protect the fruit from sunburn and better distributes weight more evenly throughout the tree. Citrus fruit is borne on the tender tips of branches out near the outside edge of the tree. Removal of these tips by pruning significantly reduces the ability of the tree to produce fruit each year.

Citrus trees also have tender bark that is easily sunburned when sunlight strikes unprotected wood. Usually the heavy canopy of leaves shades and protects the trunk and major branches of the tree, but when branches are removed or foliage is shaved from the tree, the bark is often exposed to the sunlight. Sunburn then occurs. Sunburned bark can often be found on the southwest side of citrus tree trunks whose bottom skirt of branches has been removed.

Because of these basic biological characteristics of the citrus tree, pruning of citrus may not be in the interest of the tree from a production and health standpoint. However, there are times when some corrective pruning may be necessary.

If a citrus is planted too close to a home or other structure and the branches are rubbing against the wall or roof of the home, obviously damage to the structure must be minimized. The same is true if trees are planted too close to each other and begin to interfere with each other through competition for air, water, sunlight and nutrients. In other cases, a more formal garden appearance with plants that are pruned and shaved into formal designs or figures is desired. In each of these cases, pruning, with all of its inherent risks, is required.

Young trees, and some older trees, really do need a little correction when a branch grows in the wrong direction, or if it becomes broken or diseased. In these cases, pruning is a good idea. However, hacking and chopping out huge chunks of the tree, as mentioned above, can be the beginning of serious damage down the road.

Double leaders, two major branches growing out of the same spot, do not often occur in citrus, and if they do, they are usually removed in the nursery, but if as the tree grows this problem occurs, it is a good idea to remove the weaker branch before any major growth can occur. This helps protect the tree from wind damage and trunk splitting down the road.

Major scaffold branches, the major branches that come out from the main trunk, should radiate out in all directions around the tree and not just on one side. Sometimes there may need to be one or two branches snipped and smaller sprouts allowed to grow to balance out the tree. In the long run, it is best to avoid this kind of problem by selecting a tree at the nursery that already has a sound structure. A well developed tree is a hallmark of good nurseries and getting the right one at planting time saves a lot of hassle later on.

Small trees and sometimes big ones have “suckers” that come up out of the trunk below the graft, which is found down near the base of the plant. These are rootstock shoots and rarely produce edible fruit. These should be rubbed off with a gloved hand while they are still tiny for best results. Larger ones, even when cut off close to the trunk, tend to regrow quickly resulting in a lot of extra work through the years.

Another type of common problem in citrus is the development of “water sprouts.” These branches tend to emerge...
from the major scaffold branches and grow straight up through the canopy of the trees, almost like a flag pole in the
ground. These branches often grow vigorously and produce little, if any, fruit. Because of their active vegetative
growth, they divert a lot of extra energy that would normally go to fruit production. For these reasons, it is
recommended that they be pruned out at an early age.

Broken and diseased branches should be removed as they occur. These types of issues, fortunately, do not happen
often, occasionally occur. In most cases, removal is the best policy.

All major pruning, removal of major branches or large segments of the canopy, for any tree or shrub, should take place
when the plant is in the dormant or resting phase. For example, palo verde, mesquite and other desert adapted plants
tend to go dormant in the summer, so summer pruning is the recommended time for these plants. Deciduous trees,
including fruit trees, go dormant in the winter. We prune them at that time. Most evergreen plants, including citrus.
also rest during the times of cooler temperatures. For winter dormant plants, the best time to make pruning cuts is
generally in January.

If pruning of citrus is absolutely necessary, try very hard not to remove too much of the canopy to avoid sunburn of the
bark underneath. If tender bark will be exposed to sunlight, paint the exposed area with white, latex paint. Do not use
oil-based paint because it is toxic to the wood. Water-based paint is essential. White is important because it reflects
the most light and helps keep the underlying wood cool.

It is no longer considered essential to cover the cut ends of major branches with tree sealant. Our dry weather and its
interference with disease organisms is actually the best medicine when dealing with fresh cuts. The wound will quickly
dry out and prevent the development of disease.

Finally, it is important to make correct cuts when pruning any plant. Do not cut the ends of branches to leave stubbed
ends. These types of cuts do not heal quickly and may allow entry of dry wood borers or some heart rot fungi into the
plant. Prune branches back to their point of origin.

The bottom line in pruning citrus in my opinion is simply, “Don't, unless you absolutely have to.” If pruning is necessary,
expect a reduction in yield from the true capacity of the tree.
Are you fighting tumbleweeds in your rock mulch landscape? Spurge in your lawn? Grassy weeds in the alley? If you can answer “yes” to any of these questions, you aren’t alone!

Controlling weeds can be a huge challenge for anyone, no matter what the size of the garden or landscaped yard. Whether we are caring for large areas or small, weeds can cause a huge headache as we strive to keep gardens productive and landscapes looking nice. Herbicides, chemicals that kill unwanted plants, can be helpful in this constant war, but sometimes we just do not want to use these harsh materials and would rather use an organic or all natural approach. Is it possible? Yes, it is possible, just not as fast nor as easy.

Organic or all natural weed control are terms that are used more or less interchangeably to describe weedy plant pest control without the use of pest control techniques that are not included in USDA organic regulations. In most cases, the common herbicides displayed on nursery shelves would be excluded from consideration.

The process of controlling weeds without using most of the common herbicides will require multiple steps, and the application of multiple tools. In other words, we need a diverse plan of action that includes multiple steps in order to achieve success. Creating and following a diverse plan of action can be time consuming and, if we are not careful, can test our patience to the limit. Sometimes we will be tempted to cut corners, or grab the first tool that comes to hand, no matter whether that tool is the best choice or not. Whatever weapon we choose - our hands, a hoe, or, yes, an allowable herbicide - that weapon must be carefully considered and wisely used. It takes dedication and attention to detail.

What types of techniques should our diverse weed control plan have? First, an all natural weed control program will have to include some kind of mechanical control. That is, some technique that physically disrupts the growth and development of the plant. Mowing, hoeing, or pulling weeds are common tools for mechanically controlling weedy plants. While mechanical weed control techniques are some of the oldest and most well known methods of getting rid of weeds, they can also be the most labor intensive, time consuming, and mind numbing. Be sure to wear sturdy gloves to protect your hands!

Another tool that can be used is to place a barrier between the sun and the weed seeds in the soil. Mulches of newspaper, stone, old shingles, or other materials create a physical barrier through which it is difficult, if not impossible, for weeds to grow. It is important to cover this layer with compost or bark to reflect the hot sun. Otherwise, the accumulated heat in the soil underneath may cook the roots of the plants that we are trying to protect. These barriers do not remove existing weeds, but they help prevent future weeds from germinating.

All natural weed control will also rely on the technique of environment modification. That is, we must create a difficult growing environment for the weeds while at the same time encouraging the desirable plants. This can be done through proper soil preparation; managing soils for pH, salts, and fertility; proper irrigation management; correct plant selection; good rotation practices; proper mowing heights; thatch control; and reduction of soil compaction. These critical practices are often overlooked as weed control techniques and this fact alone may account for many of the weed problems seen today.

Annual weeds, plants that germinate, grow, flower, and die in one year are much simpler to control than perennial weeds, plants that live for several years or more. The above techniques usually will take care of most annual weeds. Perennial weeds will take a little more effort.

Perennial weeds are best controlled by “growing them to death.” When we pull up an annual weed, it is dead and will not regrow. Pulling perennial weeds just stimulates it to come back from the roots with a vengeance. Their secret is the energy that they store in their roots and underground stems. As long as there is sufficient stored...
energy, perennial plants will remain alive and flourish. To control these pests, we have to consistently deprive them of sunlight and their ability to create energy from the sun, and in short, cause them to die by growing.

I know that sounds a little strange. Please let me explain. Every time a plant grows, it uses up energy. So, if we are fighting say bermudagrass or silverleaf nightshade, two common and very nasty weeds, we cannot allow them to create and store new energy through photosynthesis. How do we do that? The first step in growing perennial plants to death requires us to remove all of the plant parts above the surface of the ground; cut them off at the surface. The next and succeeding steps will be to remove the new shoots and leaves as they appear. Do not let them remain long enough to create new energy. If we can force the weed to use energy by growing, and then deprive them of the opportunity to replace that energy, the plant will eventually use up its store of energy and die. It is hard to do, but very possible. Fortunately, there are some natural herbicides that can be used to help make this process easier. We just have to spray the new leaves as they appear.

Once common organic herbicide is the acetic acid in vinegar. Sprayed on the leaves it disrupts the tissue and the leaves dry out and die. Another type of organic herbicide that will kill green shoots and leaves are the herbicidal soaps. Sold on line and through many nursery outlets with an interest in organic weed control, these formulations accomplish the same result. All of these materials are nonselective, meaning that they will damage or kill any part of a plant that is green. Corn gluten is excellent pre-emergent herbicide and properly applied will prevent or slow down the germination weed seeds.

While all of this may seem a little overwhelming, practice will make the selection of the right weed control method second nature. If you decide to use an organic herbicide, or any herbicide for that matter, remember that pesticide labels can be your best friend. When selecting a weed-killing product, read the label carefully and it will tell you all you need to know.
Now that cold weather has arrived and we have received a little bit of rainfall, there are several outdoor tasks that need attention. A little work now will save a bunch of work later on.

With these recent rains, winter weeds will begin popping up to speckle your dormant lawn with green splotches. Not only will they mar the color of the dormant turf, they will also need to be mowed regularly to keep them from growing tall and unsightly. Weeds will also spoil the effect of desert landscapes.

Ugly weeds can be completely avoided by applying a pre-emergent herbicide before there is enough moisture in the soil to germinate the weed seeds. Oryzalin is the most common pre-emergent active ingredient sold for homeowner use in our area. Look on the label for the list of active ingredients when you are searching for the right product. Pre-emergent herbicides do not kill any weeds that have already started to grow, so it is important to have the material already in place before the seeds germinate.

When you carefully read the label, you will see that the pre-emergent herbicide must be incorporated for it to be effective. This is usually done by sprinkling the lawn with water to dissolve and leach the chemical into the soil profile. The label will tell you how to do this. It will also tell you how to do other procedures correctly. Make sure you read the label.

Weeds that germinate before you get the pre-emergent herbicide in place can be killed easily if you spray them while they are still tiny with a post-emergent herbicide. These products kill weeds on contact. However, many of the weeds, like lambs quarters, little mallow and prickly lettuce, become very difficult to kill with any product after they have grown much beyond six inches tall. Then just about the only way to control these weeds is by mowing, digging or pulling. With contact burn down sprays, the secret is to apply them early.

During the winter months, it is often a temptation to forget the water and leave the plants to fend for themselves. While it is true that lawns, gardens, fruit trees and other landscape plants need less water during the cooler months, it is important to the health of all plants to have adequate moisture around the roots at all times. Usually a single, deep irrigation once a month is sufficient to meet the needs of plants. Use a soil probe or a shovel to check the soil moisture content before irrigating to avoid wasting water and creating an unhealthy, too-wet environment in the root zone.

The cooler winter months are also a good time to do needed maintenance on your irrigation systems. The plants and your irrigation system do not care what time of year it is, of course, but it is much more comfortable for us to do these chores now, rather than when it is 100 plus degrees outdoors.

Begin your maintenance by checking all sprinkler heads and drip system emitters for leaks and plugs. Broken sprinkler heads waste water. Plugged emitters cannot provide the necessary water to plants when they need it most. Both keep the system from working at peak efficiency.

If you replace a sprinkler head, be sure to replace it with parts with the same brand and type so that the replaced head will deliver the same amount of water in a given time as the other existing heads. Water application efficiency is important to maintaining good plant health and vigor.

Drip emitters can become clogged with salts or sediment and should be cleaned or replaced. As plants grow and mature, they will need more water to support the increased number of leaves. Winter is a good time to move existing emitters out away from the trunk towards the drip line of the plant and to add any needed new emitters to ensure that the entire root zone of the plant is being irrigated.

Staked trees should be carefully checked to see if the tree will stand alone without extra support. Trees with stable trunks should have the stakes removed as soon as possible to avoid injury to the trunk and branches of the tree. If
the ties on trees have started to gouge the bark, move the ties to a new location so that the wound can heal. Do not replace the ties too tightly. Allow the tree enough slack so that the trunk moves slightly with the wind. It is through this movement that the tree is able to strengthen itself.

Pruning is another task best done during the winter months when the plants are in a dormant state. Trees and shrubs should have broken, diseased or damaged limbs removed to ensure the continued good health of the plant. Most pruning on landscape trees and shrubs can usually be limited to those branches that rub against each other. Constant rubbing usually leaves both limbs damaged. It is best to remove the weaker of the two branches and to leave the stronger.

Branches of trees that do damage by rubbing against buildings, fences and roofs need to be selectively pruned. However, please, do not just lop them off. Follow the offending branch back to its point of attachment and remove the entire branch. In this way, you will prevent unsightly stubs and slow-healing wounds.

Any frost damaged leaves and branches of tender plants like bougainvillea or lantana should be left in place until the temperatures begin to warm in the spring. While they may not look their best right now, the extra layer actually serves as a protection for the healthy wood under the canopy. By keeping this extra insulation, you will have a healthier plant next spring.

Finally, the application of a good organic mulch around the base of trees will improve the soil by adding nutrients and slowing the loss of moisture from the soil. Mulches will keep tender roots warmer during the cool winter months and cut down on heat gain during the summer. Do not place the mulch up next to the trunk of the tree or shrub because it can allow soil fungi to get a toehold in the trunk tissue and eventually damage or kill the plant.

There is always lots to do in the yard even though you decide not to plant that winter lawn. By practicing good maintenance year round, many problems can be avoided.

If you have questions about this newsletter, have any plant related problems, or wish to have a publication sent to you, please call (520) 836-5221 x204 or (520) 374-6263 and leave a message. If you have a plant problem and are able to email a picture, please send a picture with any information you can provide about the plant, and your contact information to our diagnostic team at macmastergardener@gmail.com and a Master Gardener will contact you.

This newsletter is available to view on our website at:  http://extension.arizona.edu/pinal

Richard D.Gibson
Extension Agent, Agriculture

59 mailed copies
262 emailed
Have a sick plant or just questions about caring for your plants?

Visit our Plant Diagnosis Clinic held every third Thursday of month from 9:00 to noon at the U of A Cooperative Extension 820 E. Cottonwood Lane, Bldg. C Casa Grande, AZ 85122

Or you may call the Maricopa Agricultural Center at (520) 374-6263 and leave a message.

If you are able to email a picture, please send it with any information you can provide about the plant, and your contact information to the diagnostic team at macmastergardener@gmail.com and a Master Gardener will contact you.

Two Garden and Landscape Short Courses to begin in January 2018

Apache Junction classes begin on January 16, 2018
At the Central Arizona College, Signal Peak Campus, 805 S. Idaho, 1:00pm to 4:00pm
For more information or to register, please contact:
Carol at (602) 438-4003 or the Pinal County Extension Office at (520) 836-5221 ext. 0

Casa Grande classes begin on January 17, 2018
At the U of A Pinal County Cooperative Extension, 820 E. Cottonwood Lane, Bldg. C, 9:00am to 12:00pm
For more information or to register, please contact:
BJ Seemuth at (520) 431-6167 or the Pinal County Extension Office at (520) 836-5221 ext. 0

How to connect with Rick Gibson online…

Blog: Booming Deserts
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