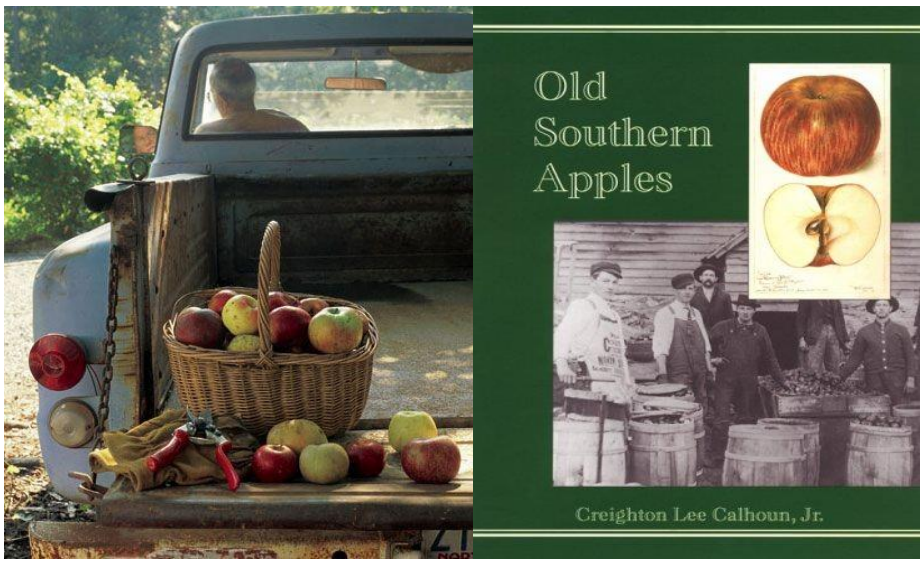
Growing Mountain Apples in the Home Orchard



Creighton Lee Calhoun 1933 - 2020

https://elizapples.com/2020/02/22/the-passing-of-c-lee-calhoun-southern-apple-hunter/

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Growing Mountain Apples in a Home Orchard

Apple trees require care and attention if they are to grow well and produce quality fruit. Many old heritage apple trees seem to exist without such care, but they are often old survivors in ideal locations. In their early years someone was taking good care of them. Getting apple trees started with adequate TLC is helpful to a long healthy life. We should all thank our grandfathers for their fine work! Following the guidelines below should help you grow healthy and productive apple trees that will survive for your grandchildren.

The recommendations in this document include sound cultural practices. Hopefully practicing these will also minimize some of the need for pesticide use for your home orchard. However, while these cultural practices work well for all apple growers, if your plans are to have a commercial apple orchard growing fresh market apples to sell, these practices may not be all you will to do to meet all your apple production needs.

This guide has two parts:

Part One: Plans for Initial Planting and Establishment of Apple Trees.

Part Two: Home Orchard Pest Management.

Planting and Establishing Apple Trees

WHEN TO PLANT
In Avery County and other areas above 2500 feet elevation, March or April are the best months to plant apple trees. (Fall planting is often a good idea below 2500 feet elevation.) Either way, the trees should be planted while dormant (without leaves). In June and July containerized apple trees can still be planted with success.

WHAT TO PLANT - Varieties, Rootstock, and Spacing
There are so many different varieties of apples there is not enough room here to even begin a discussion about which apple variety to choose to grow. The life work of Creighton Lee Calhoun provides most the information one would ever need to know. A link to a short article on Calhoun's life and work is listed on page 31.

Whatever choices you make, always know what rootstock the variety is grafted onto. All named apple varieties (cultivars) are grafted trees. The eventual size an apple tree will depend, to some extent, on what rootstock it has been grafted on.

Most of our heirloom apple varieties are grafted onto M-111 rootstock.
Characteristics of M-111 rootstock:
-Vigorous growth
- Disease resistance
- Withstands wet and drought conditions.
- Can produce a tree about fifteen to twenty feet tall, if pruned properly.
- Will usually begin to produce fruit in four to six years.
- Trees can live 100 years.

Trees on M-111 rootstock are best planted 20-25 feet apart in the row with 20 feet between rows. A bare minimum spacing would be fifteen feet in the row.

Cooperative Extension Plant Sales may offer apple trees on a more dwarfing rootstock like the Geneva 202. G-202 is also disease resistant and very productive but should grow your tree to only about 10-12 feet. Therefore G-202 can be spaced closer, at about 10-15 feet in the row with 20 feet between rows. However, unlike the M-111, the G-202 will need support. We advise you to drive in a 6-8 ft. T-post 12 inches from the tree, at the time of planting, for support. This post should stay in place for the life of the tree. Use loose rope to support the tree. Note: the lifetime of a G-202 rootstock tree is still unknown, since they are so new, but estimates are 50 years or more.

SITE SELECTION
Trees should be planted where they can receive direct sunlight for at least 6 hours each day, but more, 8-10 hours is preferable. Gently sloping hillsides facing north or east are optimum. However, getting more sunshine per day is the most important factor. Locations providing good air circulation, like higher ground, are best. Avoid low lying wet areas and cold area collection or frost pockets. Higher and cold locations are not a problem with apple trees. They normally tolerate temperatures to -25 degrees well.

Don't forget to take the time to inspect the soil. Dig test holes. You need a location with some good topsoil and hopefully a well-draining sub-soil. If you find a location with no top soil and heavy clay subsoil, consider another site. A bad location or poor soil quality are things that cannot be readily fixed.

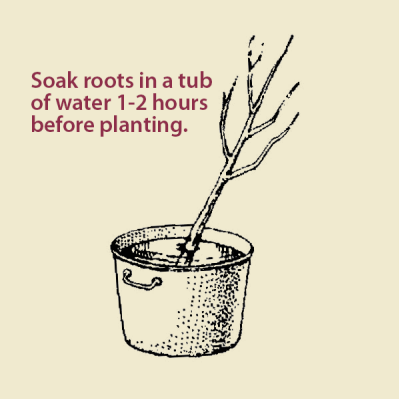
SITE PREPARATION
Managing Soil Fertility

Fixing soil nutrient problems after establishment is very difficult. If at all possible take a soil sample in advance of receiving the trees. Ask your Cooperative Extension Center for help with soil sampling advice and see, **"https://content.ces.ncsu.edu/soil-and-plant-analysis-for-apple-trees."** When you've received your NCDA Soil Report have your Extension agent help you read it and develop a plan to apply fertilizer or lime before planting. Applying your soil amendments before planting is the best idea.

If time doesn't allow for applying soil amendments ahead of planting time, you can still apply important soil amendments when planting your trees by using the **"Time of Planting"** approach. This involves adding specified amounts of soil amendments (fertilizers) during the planting process. This technique is explained on the next page.

PLANTING YOUR APPLE TREES

1. Apple trees usually arrive from mid-March to mid-April. After receiving the trees, store them in a cool dark location and plant them as soon as possible. If for some reason you cannot plant them within a week, the trees can be "heeled in" in a shady location and protected from the wind. Keep the roots wet until planting time and plant as soon as possible. Right before planting, be sure to put the trees in a bucket of water to soak for 1-8 hours.



Stark bros nursery

2. Carry with you the following tools:
Long handled shovel or spade
Garden rake
Hammer or hatchet
Hand pruners
Light rope or soft heavy cord
Wooden stakes, 3-4 foot have at least one per tree

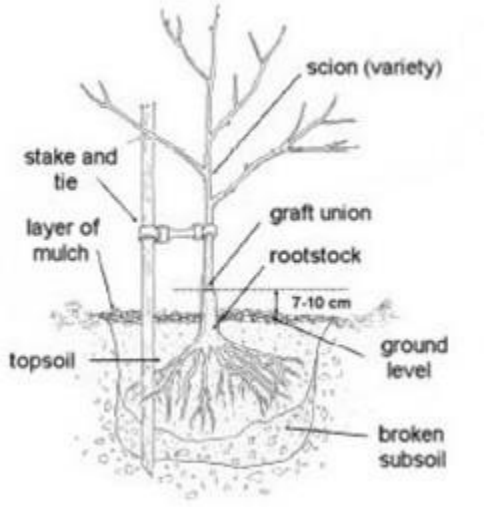
If planning to use the **"Time of Planting"** soil amendment approach, also take with you the following fertilizers.
Pelletized dolomitic lime
0-45-0 fertilizer or bone meal.
Measuring Cup - **1 cup size.**

3. If you have been forced to settle on a location with soil of questionable quality, it is OK to add compost or other organic matter. However, **do not fill the planting hole with organic matter**. Instead, work organic matter into the soil before digging the hole. You can "dig or turn in" organic matter of your choice with the long handled shovel in a 3ft. x 3ft. square. Then dig the planting hole in the center.

Dig the planting hole about 12-16 inches deep and 18-24 inches wide. Pile the soil very close around the hole on all sides. Break up the removed soil some so that it is free of large clods. Return just a little of this loose soil into the bottom of the hole. Prune the tree roots very lightly, shorten only long roots that will not comfortably fit in the hole.

"If using the Time of Planting Method"

4. At this point add 1 cup of the dolomitic lime and 1 cup of 0-45-0 fertilizer or bone meal into the bottom of the hole. Lightly mix together the loose soil and these materials. Next, evenly spread another 1 cup of lime and 1 cup of 0-45-0 or bone meal on top of the loose dirt surrounding the hole.



Pinterest

5. Remove any tags or labels from the bottom of the tree and hang them higher on the tree. Now, stand the tree up in the center of the hole, spreading the roots in all directions. Lay the long handled shovel or rake across the top of the hole (at true ground level) and look to see where the handle touches the tree trunk, **(**picture above).

Each apple tree has a "graft union", a swollen spot on the tree trunk, where the rootstock and scion wood " healed" together. The point where the tool handle touches the trunk should be about where the soil line will be once you've backfilled the hole. You want the "graft union" to be 1 to 2 inches above the soil line but never below the soil line! If it doesn't line up correctly remove some dirt from the hole or add some back until they line up properly.

When the graft union appears to be lining up well, Hold the tree straight, and pull the surrounding dirt into the hole. The fertilizers will mix with the dirt as you pull the soil into the hole. As the hole fills with soil, pack the dirt firmly but gently with your boot. Pull all the dirt into the hole making the soil surface "level" or a little rounded.

At this time you should be able to see your graft union showing just above the soil surface. Never bury the graft union below the soil line but don't leave it 3 inches or more above the soil line either.

6. Before doing more with the tree, let's finish with the fertilizers. Starting at the edge of the planting hole spread about 6-8 cups of lime and 6-8 cups of 0-45-0 or bone meal in concentric circles moving away from the tree at least 6-8 feet. Distribute the materials evenly on the surface. Your soil amendments for this tree planting are now completed. **Note: You should never apply any fertilizer containing nitrogen at the time of planting.**

WATER

You should now water the planting hole thoroughly to make sure that the roots are moist, and the soil around the roots should be free of air pockets. Over the next 30 days, if rain does not come regularly, watering will be necessary. After 30 days, continue to water the tree if there are periods of dry weather (two weeks without rain). For the remainder of the summer & fall months monitor the weather and irrigate if needed to **make sure the young tree gets <u>at least</u> 1 inch of rain or water per week.** After the first year, watch for dry spells and help your tree if the weather doesn't cooperate.

Staking

The first couple of years all apple trees need extra support, by staking. The stake will greatly assist tree growth. Figure out what direction the prevailing wind will be coming from, often from the northwest, but not always. Drive in a single 3-4 ft. support stake (T-post or wood), straight up, 8 - 12 inches away from the tree; Leaving it standing at least 3 feet above the ground. Tie a non-abrasive soft rope around the stake. Then loop it around the tree. The horizontal rope between the tree and stake can be twisted a little to provide good support, but avoid choking the tree in any way. The stake should hold the tree still in the soil during periods of strong winds. This stake support should be needed for only a couple of years. During these years adjust the rope when it gets "slack". It should remain tight to provide support.

If you are locating your apple trees in a highly windy location, you should consider putting in two or even three stakes, to provide better support against heavy winds. With the more dwarfing rootstocks like the G-202 or Bud-9, plan to use 6-8 foot T-posts in place of these temporary stakes. **The roots of some highly dwarfing rootstock require lifelong support!**

Tagging
Your apple tree should have come with a tag attached to the tree, if not make one. As the tree grows the tag may damage the tree. We recommended you remove any tags and reposition them on your support stakes. You can leave the stake and tag there for years. However remember to remove the rope after 2-3 years. It is also a great idea to draw a map of your orchard, locating each tree variety.

This should cover most the planting activities today. However there are most important things to do within a few weeks. **Mark on your calendar to return in about 3-4 weeks.** Apples trees may not grow well on their own. They need your help!

PROTECTING YOUR NEW TREES

Protection from Animals

The most likely pest to first attack and damage your new apple trees will be DEER! In recent years, increasing deer populations have made deer our most threatening pest on young apple trees. They will eat the new young leaves, limbs, and bark. When deer bite off the new growth of a young apple tree, they can easily ruin a 1-3 year old tree over night! Often we think of deer ruining a tree by horning them with their antlers. We'll deal with that too. For all these reasons, growers in most locations should take precautions. Deer damage can begin within days of the first appearance of new leaves. Be ahead of the deer!

For small home orchards with moderate or heavy deer pressure, a good choice may be to place a wire cage around each young tree. It must be at least five feet tall and 4.5 - 5 feet across. After years of experience we have learned that concrete reinforcement wire is the best choice for individual cages. This is the 6 inch by 6 inch wire product placed in concrete floors. It makes the most effective and least expensive cage found to date.

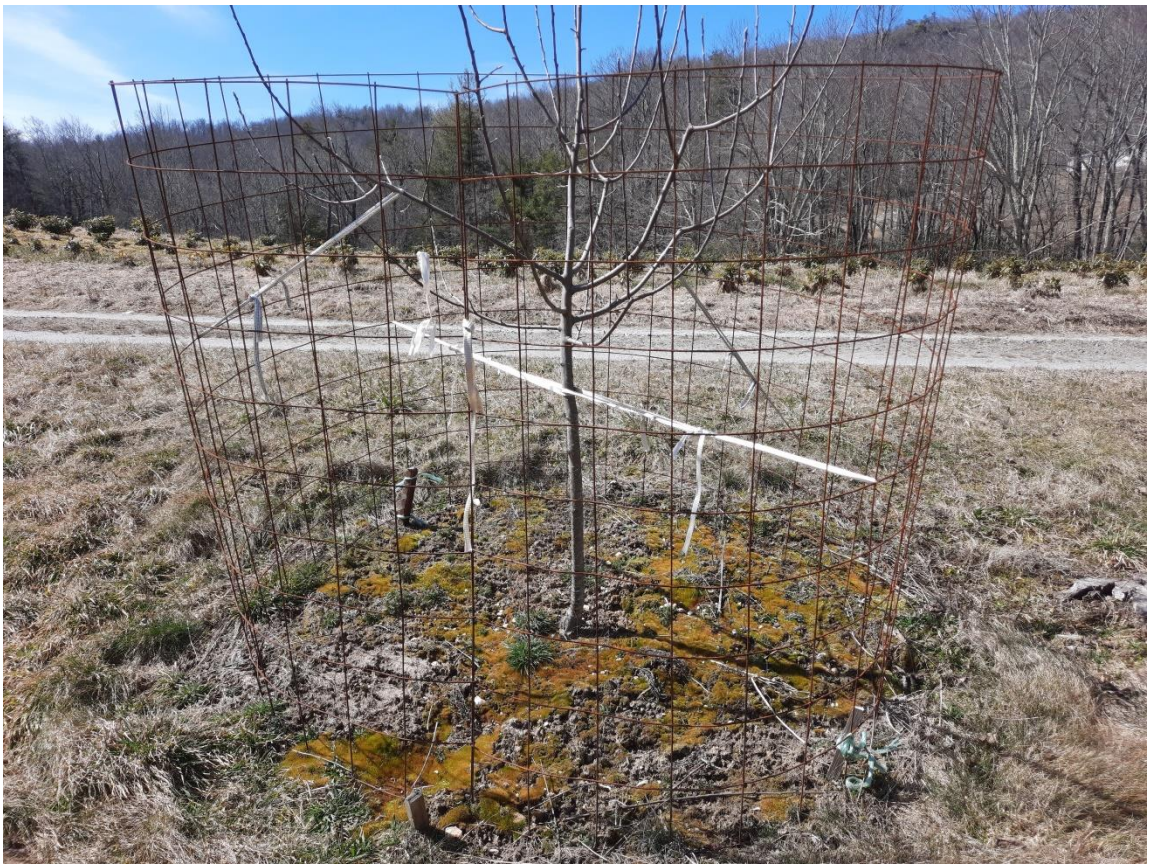
Building a Deer Cage

Building individual cages for each apple tree can be a good choice when the deer pressure is moderate or heavy and perimeter fencing is not practical. Concrete reinforcement wire is available at most building supply and concrete supply companies. This wire is 5 ft. high and may come as a 150 foot roll. Each roll can make 8-9 cages. You will have to have an inexpensive bolt cutter to cut the material.

Cut a length of this material about 15-16 ft. and it will naturally roll into a cylinder shape with a 4.5 foot diameter. That is a good width, smaller is too small. The cage will stand up well on its own. However, we do recommend staking it with 2-3 short wooden stakes, on opposite sides, just to be sure it can't be turned over by the deer.

You can close the seam (or door) with simple twine to untie, open and step inside to work with the tree. Once the cage is staked you can tie rope to the wire cage to support the tree during the first 2-3 years instead of the single stake method stated earlier. The cage also provides many places to tie twine when training your tree. This is described in "Pruning and Training Young Apple Trees" on page 14.

Growers usually leave the cage on for about 5-6 years or until the tree grows enough to be tall and beyond serious deer damage. These cages can last for many years. They can then be shared with others for future use. The cages, being rusty brown, blend in well visually with the environment.



Hundley Orchard

Repellents

If you have a small number of trees and are living in a location with only light deer activity you might get by with a deer repellent. An effective and inexpensive choice is "Dryer Sheets". Hanging a couple of dryer sheets (with clothespins) on a young apple tree can repel deer for up to a month. Do replace them monthly. For season long use fragrant soap bars have been used for years. Drill a ¼ inch hole thru the soap and the box. Then hang it with a wire from the tree with the bottom of the box open. The bar of soap will last longer when protected from rain.

Be prepared to switch repellents as deer will get use to one repellent. You can always check with your Cooperative Extension Center for more information of different, more expensive but quite effective repellent products. However, repellents don't always succeed in heavy deer pressure areas. If repellents don't work in your location, quickly go to cages or perimeter fencing!

If you have a larger planting of trees in any deer pressure location; you might consider perimeter barrier or electric fencing. Call your Cooperative Extension Center for more information on deer fencing options. Options range from about $4 - $12 per linear foot. Some repair or maintenance may be required

Rabbits

Rabbits commonly chew on apple-tree bark especially in the wintertime. To prevent rabbit damage we recommend making a cylinder at least 24 inches tall and 8-10 inches wide using wire rabbit fencing or chicken wire. This cylinder cage should be positioned at the time of planting the tree. We suggest leaving it on the tree for about 10 years. This should protect young tree from rabbits and weed eaters too during the vulnerable years. Black corrugated pipe or any tight plastic wrapping is not recommended. They can create a habitat for rodents and prevent you from seeing borer activity. Note: We are hopeful that these wire rabbit cages will also deter deer from horning your young trees.

Voles

Voles are one of the most dangerous pests of apple trees. They kill a high number of young trees each year by chewing the roots off the tree. Unfortunately there is nothing you can do to protect your new apple tree at planting. The Pine Vole lives most of its life underground. We often don't notice the Pine Voles until they have killed some trees. This seems to be the most common vole in the mountain area.

However you can spot them. Plan on watching for them each fall and winter, when they are most active during these months they will be creating mounds of loose dirt within the orchard. When you spot these mounds, promptly take a hoe or shovel and pull the dirt back off the vole's burrow. Pour about a 1/3 cup of "Ramik Green AG", (a rodenticide), in the spot and pull the dirt back over the material. Then place a rock on top of the loose dirt. Keep an eye out for new mounds and treat them as soon as you see them. Scouting for Pine Voles should be an on-going routine for the life of your orchard.

Early Protection from Grass and Weeds

Grass and weeds should be strictly controlled during the first several years of the life of an apple tree. For at least the first five years, grass and weeds, should not get established within 2-3 feet under the tree in any direction. Grass will seriously hinder tree growth at this age.

Keep about a four foot diameter circle under your young tree free of grass and weeds using either an herbicide or mulch. April or May should be an ideal time to create the circle. Roundup @ 1.5 oz. per gal. of water kills the emerged weeds and grasses on which you apply the spray. It doesn't kill the seed below ground. In about 6-8 weeks new weeds will emerge and grow, requiring another application. Two to three applications of Roundup can give you season long control of weeds and grasses around the base of your tree. **Remember that Roundup will also damage trees if sprayed on the bark or leaves of a young tree. So be very careful! Do not spray in windy conditions!**

Mulch is a great choice, as it will conserve soil moisture as well as provide some weed control. You could use pine needles, shredded bark, or weed fabric. However, voles and other rodents find mulch to be a friendly habitat if it's TOO DEEP! Be careful to limit mulch to only 1-2 inches. Also keep the mulch back from the tree trunk by a couple of inches and never cover the graft union with mulch.

Early Protection from Insects and Diseases

We know that spraying pesticides on your apple tree is not something you look forward to. With Integrated Pest Management (IPM) as our guide we hope to minimize the need to spray. Cultural practices going back hundreds of years give us ideas for managing pests in apple trees with less pesticide use. Scouting, knowing the pests, and wise decision making, give us an advantage. In early years, a couple of pests are very dangerous.

Apple Tree Borers
A group of pests that can attack and kill young apple trees in our area are the apple tree borers, primarily the Round Headed Apple Borer and the Dogwood Borer. Early on these trunk borers often result in the death of the apple tree. **Right now, before the end of May, you need to apply a control or repellent on the trunk of your young apple tree and plan on doing this each spring. Details on these borers and the choice of methods and products are explained in the HOME ORCHARD PEST MANAGEMENT section on pages 15-19.**

There is another issue called **Southwest Injury** that can injure apple trees up to at least 12 years old!. This doesn't happen but to a large percent of apple trees. However, if you are located on a site that faces south or west, Beware! During winter months we can have warm spells that allow the sap to the rise in younger apple trees. If this warm spell is followed by a sudden, deep drop in temperatures the sap can expand and split the bark, leading to severe damage of the tree.

It's called Southwest Injury because the bark will often split on the southwest side of the tree. Prevention is the only effective action and this is exactly the time to do it. If you have this slope aspect, apply latex paint with a light color (white or beige) to the bottom 3 feet of the trunk. You can thin the latex paint about 30% water. **Re-apply this protection each year for about 12 years if you decide your site may be at risk! This damage is usually fatal to the apple tree!**

Having dealt with all these threats, animal, insect, disease, and even mechanical, you would think you are finished. However you still have to **Feed your Trees!**

Nitrogen – First Year

About 4-5 weeks after planting your apple tree you need to make your first application of nitrogen fertilizer! All your fertilizer before and during planting will help you trees for many years. **However Nitrogen has to be applied during the growing season.**

Nitrogen or "N" provides the fuel for growth. For the best possible growth it should be applied three times a year. This first year, 2 applications will be enough and now is the right time to begin. Having waited about 4 weeks since planting, you should apply 2 tablespoons of 46-0-0 fertilizer, in a circle, around the apple tree. Keep it back about 12-14 inches from the trunk. The "Nitrogen only" fertilizer that we recommend is 46-0-0, a very cost efficient and slower release nitrogen. Note: It must be kept very dry in storage to remain usable.

You are now finished with the initial Planting and Establishment of your new apple tree! However, your work growing apple trees continues. In 8 weeks (July?), you will want to return to check on your new tree and see how it's growing! Hopefully your apple tree will have 6-10 inches of new growth now. Two things to do when you return in July will be to apply the same amount of 46-0-0 fertilizer you just applied, 2 tablespoons.

This should also be about the right time to pull grass and weeds or for your next Roundup application. Do not worry about doing any pruning this summer. However, don't forget you will need to apply nitrogen fertilizer each spring and summer for several more years and below is your Guide.

Note: If you did not go by the "Time of Planting" fertilizer applications. And perhaps did not do any soil sampling ahead of planting, see the "Special Note", top of page 12 at this time.

THINKING AHEAD – ANNUAL NITROGEN APPLICATIONS

Establishment (Non-bearing Trees)

The first few years you want to grow the tree not necessarily the fruit. This is the time to grow the woody framework of the tree. "Nitrogen only fertilizer" 46-0-0 is recommended if you soil sampled, pre-applied nutrients or used the **"Time of Planting"** fertilizer system at time of planting. Beginning the second year, apple trees should be fertilized with nitrogen three times a year to achieve the best possible growth. The three applications are best started in March and should end in July.

1st in March,
2nd in May,
3rd in July. (no later)

The amount of nitrogen fertilizer you apply should increase each year, as the tree grows.

Year One	1 oz. 46-0-0 = (2 tablespoons)	each application - (2 times) - 1st yr.
Year Two	1.5oz. 46-0-0 = (1/4 cup)	each application - (3 times)
Year Three	2 oz. 46-0-0 = (1/3 cup)	each application - (3 times)
Year Four	3 oz. 46-0-0 = (1/2 cup)	each application - (3 times)
Years 5-7	3 oz. 46-0-0 = (1/2 cup)	each application - (3 times)

Do not exceed this 3 oz. rate of 46-0-0 per application. Always spread your fertilizer evenly, in a circle at the drip line. Imagine your tree roots are growing outward at about the rate as your tree branches. That point is your dripline.

Maintenance (bearing trees)

After about 5 years in the orchard, when the trees begin producing fruit and the tree is large enough to support an adequate amount of fruit, they likely will not require as much nitrogen. Growing excessive woody growth past this time is a liability. Why? Too much pruning! Excessive nitrogen can also make the fruit soft, delay ripening, and cause early fruit drop.

Healthy apple trees will often grow 12-18 inches a year. If you are seeing that length of new growth during the fruiting years additional nitrogen may not be necessary. Contact to your Extension Agent in about 5 - 7 years after planting your tree and get his opinion.
Adjusting fertilizer applications can be made every few years using new soil sample info. Some fruit quality problems can be connected to nutrient levels. Plant Tissue samples can also be taken to help solve these problems. Call your Cooperative Extension Agent for help.

Special note: If you planted your new apple trees without applying lime and phosphorus applications before or during planting, you might want to make your annual nitrogen fertilizer applications with another fertilizer. In this case we recommend using 18-46-0 fertilizer at the following rates, for each application, March, May, and July.

Year One	2.5 oz.	18-46-0 - (1/4 cup)	each application (2 times)
Year Two	3.5 oz.	18-46-0 - (1/3 cup)	each application (3 times)
Year Three	5 oz.	18-46-0 - (1/2 cup)	each application (3 times)

Note: In this case you should also plan to take a soil sample and have your Cooperative Extension Agent help. You may likely need a new plan for liming and fertilizing your apple trees.

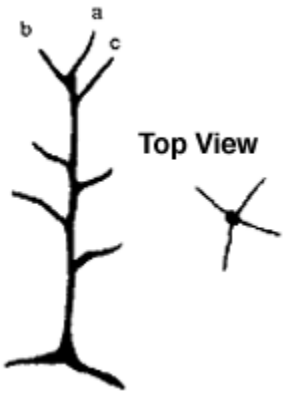
PRUNING AND TRAINING YOUNG APPLE TREES

Pruning or Training your young apple trees, the first several years, is important. These early years are the time to build the framework of your tree. Good limb spacing and strength will have a big impact on the overall health of the tree. Good pruning practices will allow sunshine to reach deep into the tree and reduce disease problems, produce high volume, higher quality apples, and help your tree to live a longer productive life. Good pruning can certainly reduce the need for pesticide spraying. To get a young apple tree started with good pruning practices will make future pruning much easier.

NOT INTERESTED IN PRUNING YOUR YOUNG TREE?

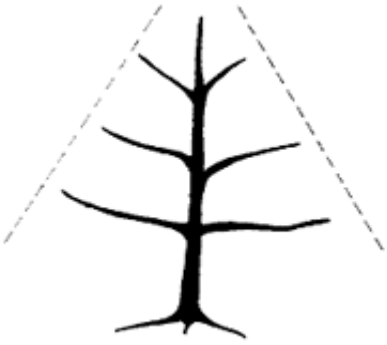
GOOD LUCK LATER!

Pruning - First year after planting.
In March or early April check on your young apple tree planted the year before. The top leader or center trunk top growth should be cut back to a length of 18 inches. If the top leader is less than 18 inches cut it anyway, just above a highest bud. If there are more vertical leaders growing straight up like the top leader, remove them with a cut flush with the trunk. You want only one central leader and only one central trunk in years to come.



Spring of the second year and Remove limbs a and c

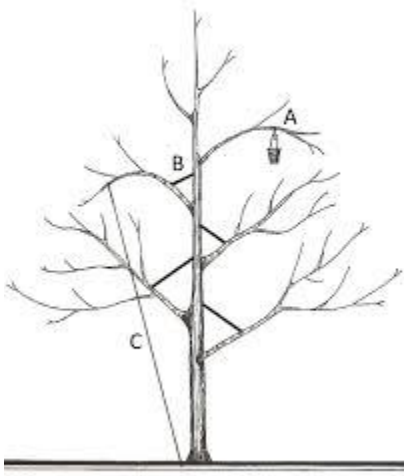
Many varieties of apple trees have a tendency to grow branches upward. To develop the best growth habit for fruit production, we try to discourage this and get the scaffold branches to grow in a more horizontal direction. The horizontal branches that grow most of the fruit are called scaffold branches. We want to have only about 2-3 scaffold branches per foot of trunk. Vertical branches in apple trees generally do not grow fruit.



drawings by Mike Parker NCSU

Over the years pruning your apple tree will be mostly about removing vertical growth. The training of a young apple tree involves taking strong scaffold branches and having, or lowering, their position at an angle of about 5 - 45 degrees above horizontal. We want them to be distributed evenly in all directions and not crowding each other. This is done by removing un-wanted limbs or branches as needed.

Most every apple tree will also have a few "weak crotch branches" The union or point where the branch attaches to the trunk is called the "crotch". The "crotch angle" can be strong, where it is close to 90 degrees, like a "right angle" or a capital "L". That is excellent! However some will have a weak crotch angle, where the crotch angle of the branch grows much too vertical. These branches will grow to become either un-wanted leaders or become too weak to hold the weight of fruit in a few years. Remove them totally. Hopefully your apple tree will look like the diagram above on the left.



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Some scaffold branches may begin with a strong crotch angle, then turn upward and finish their growth mostly vertical. These branches are OK , and can be used but may need to be trained. When you see these types of scaffold branches, go to them the next in April or May, and adjust the angle of the branch with a spreader or twine, and "train them."

Spreaders can be homemade or purchased. They often last for years, and are re-useable, (see above). Tying branches toward horizontal training is temporary but very effective. Cut a piece of twine 4-6 feet long. Tie one end low around the trunk and come up with the other end and wrap it around the limb you want to train. Pull the limb downward to 10 - 45 degrees above flat horizontal and tie it off. (see above). **Leave twine in place for 6-8 weeks, then come back and <u>remove it completely</u>.** Spreaders or twine will re-position the limb permanently after about 2 months. These more horizontal trained branches will now make more fruit before and spread the width of the tree, keeping the fruit closer to the ground. **Do not leave the twine on the tree as it can girdle the limb or the trunk by the end of the summer!**

As the early years go by the tree will grow bigger and thicker. You'll have more complicated issues and questions about pruning. **The best thing you can do is attend a Pruning Workshops put on each spring by a Cooperative Extension Agent.**
However if you prefer go to this NCSU Pruning Guide:
https://content.ces.ncsu.edu/training-and-pruning-fruit-trees-in-north-carolina

HOME ORCHARD PEST MANAGEMENT

We know many home orchard growers don't want to spray their trees unless they really have to. Here's some good news; many apple tree varieties will produce good quality fruit with little if any insecticides or fungicides. These varieties can be considered when deciding on your choice of apples to plant. Your Cooperative Extension agent has information on these. Choosing resistant varieties is one of the basics of Integrated Pest Management (IPM). IPM goals include spraying pesticides only when necessary and then using least toxic materials. Many IPM practices are shared in the upcoming pages.

What about fruit quality? Supermarket apples are usually in near perfect condition. However what's considered "good quality fruit" is relative. It may depend on the orchard owner and on the planned use for the apples. Apples can be used for fresh eating or cooking, juice and cider, or for feeding livestock or wildlife. There have always been different quality requirements for fruit. This decision depends on the home orchard owner, yourself. What quality do you require? In modern times there's more concern about pesticide use. However be aware that a few pests can threaten the life of the tree and/or most of the fruit.

While there are many insects and diseases of apples, there is likely going to be far less pressure from pests in the home orchard when compared to a commercial orchard. Commercial orchards create monocultures or mass plantings for a pest's delight. Small home orchards usually do not attract as many pests. From local experience, we've seen that small orchards of 5 to 10 trees will probably enjoy much less pest pressure. If you are deciding how many apple trees to grow, consider this.

When first starting an orchard you will need to be focused on growing trees, not the fruit. After 5 years that will change to include fruit and you'll be dealing more with fruit quality concerns. This sets up two different sets of pest management goals. In the beginning you want to grow strong vigorous trees. To get the best tree growth in the early years, focusing on certain pests is required.

Non-Bearing Years

The primary insects to be concerned with during these early years will be pests that reduce tree growth. The insects of concern are **apple wood borers, leaf hoppers, aphids, and Japanese beetles.** The most common diseases during the first years will include **powdery mildew and fire blight.** Walking thru your orchard to observe or scout your young trees perhaps once a month, from May thru August.

Light outbreaks can often be tolerated without the need to make pesticide applications. However, sometimes pests can build to higher populations and may need your intervention. In these early years making a pesticide application can usually be done successfully with a hand carried or backpack sprayer. Details on managing these pests are coming in the next few pages.

Fruit Bearing Years

When your apple tree growth has developed and ready for fruit, the best years begin. You get to start enjoying your apples. However now you may see some new pests that target your fruit. If you are a small home orchard grower we would advise you to consider not spraying pesticides preventively, in the beginning. See how your choice of apple varieties do or do not attract insects and disease. Different pests are known to be variety specific. When you start seeing fruit damage, bring apple samples to the Extension Center to find out what is causing the damage. You'll have plenty of time to identify and learn more about the pest causing the damage. You'll have time to consider your choices, decide on a plan, and deal effectively with your fruit pest issue next year with the guidance of your Extension Agent.

Pest Management - The non-Bearing Years

Apple Tree Borers

The most threatening pests for young apple trees in our area are the apple tree borers. They are primarily **the Round Headed Apple Borer (RHAB**) **and the Dogwood Borer.** The RHAB has been found to kill young apple trees frequently in the mountains of Western North Carolina. The frequency of borer damage can become serious in orchards close to native timber and woodlands.

Adult borers lay eggs in the trunks of apple trees in early summer, June 1st - August. Borer larvae that emerge from these eggs bore deeper into trunks and roots. The larvae (depending on the species) spend as little as 1 year or as long as 3 years tunneling under the bark, before they emerge as adults. This often leads to the death of the tree.

The first sign of infestation is a reddish "sawdust" (insect excrement, or frass) coming out of the lower trunk. This often starts in June and may continue through August. Seeing this frass indicates you have the dreaded RHAB and any prevention method is failing. Once seen, you have basically one chance, using a knife and wire, to probe into the hole and kill the borer. Once the borers chew their way deeper into the tree it becomes much more difficult to remove them.

Your great grandfathers used this manual approach. To stop the damage from borers this way is labor intensive but can be effective. However, prevention is easier and worth your time.

Round Headed Apple Borer - adult and larvae stages

(realistic size)

ncat.edu

extension.unh.edu

Hundley

A heavy attack by the Round Headed Apple Borers with distinctive frass

There are different prevention methods to consider. All involve protecting the lower 2 feet of trunk of the tree. The adult RHAB beetle lays her eggs (called oviposition) in the bark by cutting a deep scar and depositing her eggs. In the early years an apple tree is highly vulnerable to borer damage. Plan to protect your tree from the RHAB for about the first 10 years.

Conventional pesticides have been used to kill these borers before they bore into your tree and thus prevent infestation. Registered for use in home orchards are specific synthetic permethrins. These are easily applied, not expensive, and work for about 30 days. Your Extension agent can provide more details. These should be sprayed only on the lower 24 inches of trunk and any exposed roots. There is no need to apply it on leaves or apples. Spray coverage should be heavy, included soaking a material into the soil. **This treatment will need to be applied monthly in May, June, July, and August. Follow all pesticide label recommendations.**

An organic approach to prevent the oviposition of eggs by the borers has recently been tried by organic apple growers with some success in the northeastern US. Tested by Michael Phillips, noted organic apple innovator and author of "The Holistic Orchard". Phillips recommends brushing "pure" Neem Oil on the lower 12 inches & exposed roots of young apple trees in April or May. He has seen good results when he re-applies this treatment each spring for at least the first 5 years, perhaps 10 years after planting. Note: This new approach has not been tried in Western NC or tested by NCSU apple researchers or the Avery County Extension staff.

Phillips recommends, as we do, with any prevention method, to watch closely for egg laying and frass coming from above or below the preventative treatment area. Regular scouting for the telltale frass from June through August will give you a chance to catch any infestation that begins despite your prevention efforts. Then you can go after the RHAB with knife and wire, as described more thoroughly below.

Before the invention of modern materials, our ancestors mostly dealt with the RHAB and other trunk borers with a "hands on" approach called "worming". Worming involves digging out the young borer larvae using a knife and piece of wire with a hooked tip. **W**hen frass was noticed they cut with caution, being sure not to remove more wood than necessary. Having removed some bark to locate the borer's small tunnel, they would use the wire to probe for the borers. **Please call the Extension Office to get assistance if you see this frass on your apple trees.**

Keeping weeds and litter away from the base of trees, to be able to see the "frass", and any signs of entry is very helpful. Having the base or your trees clear also helps to allow beneficial predators, like our woodpeckers, to help control the RHAB for us.

In recent years, with different materials available, new physical barriers are being tried to prevent the adult borer from laying their eggs. Some of the best material choices may be aluminum window screen or wire mosquito netting. It likely needs to be a metal screen, not plastic or other soft material. It will need to cover about the bottom 24 inches of the trunk. At the bottom it will need to be buried in the soil at least a couple of inches. At the top it needs to be closed tightly around the trunk making it impossible for the RHAB beetle and/or DB moth to get inside the screen.

Cornell University suggests removing this barrier at the end of the season (September) so not to girdle or damage the trunk. This barrier will need to be replaced each spring by mid-May. A common paper stapler may be used to seal the seams of the window screen.

Note: If built larger than pictured below, this aluminum screen barrier might be used for several years to extend the life of the barrier, with modest adjustments, made each spring.

Travis Proctor

<u>If you have young apple trees and are not using some type of borer protection.</u>
Please call your County Extension Office for information. A complete 1999 Cornell University article on apple borers: **https://ecommons.cornell.edu/bitstream/handle/1813/43070/apple-boring-beetles-FS-NYSIPM.pdf?sequence=1&isAllowed=y**

Aphids & Leafhoppers

These insects are routinely found on young apples trees and very light numbers shouldn't impact the growth rate of your young apple tree. However, in greater numbers they can cause a stunting of the new growth that can slow the total tree growth rate. Woolly apple aphids (WAA) are dark purple under a protective covering of a white fuzzy mass. WAA are often found in the forks of twigs and on leaf petioles**.**

Woolly Apple Aphid (WAA)

Several other types of aphids feed on apple trees including rosy apple aphids and green apple aphids. Rosy apple aphid and green aphid eggs overwinter in the cracks of tree bark, and hatch in the spring when there are actively growing buds and leaves to feed on. Rosy apple aphids are purple. They feed mainly on flower clusters and spur leaves. Green aphids feed mainly on new leaves in spring and growing shoots during summer. Adult aphids produce live young (skipping the egg stage) ready to feed on plant juices. This feeding results in curling of leaves. Aphid excrement is sticky and referred to as honeydew. A fungus known as black sooty mold grows on the honeydew and which deforms shoot growth and creating a dirty appearance of the fruit.

Rosy apple aphids

Steve Schoof / NCSU

Green Apple Aphids

Steve Schoof / NCSU

Three types of leafhoppers are also common pests on apples leaves: white apple leafhopper, rose leafhopper, and potato leafhopper.

Leafhoppers

Leafhopper damage

There are some predators commonly found among the aphid colonies and if left un-sprayed, can sometimes clean up the aphid colony. The common aphid predators include the green lacewing larvae, and the hover fly larvae. Young and dwarf trees are susceptible to aphid and leafhopper damage. Starting in May, scout trees carefully, looking at new shoots, and the underside of leaves. Call your Cooperative Extension agent for treatment options if you think Apple aphids or leafhopper populations are becoming significant.

Japanese Beetles

Adult beetles are about $^{5}/_{8}$ inch (16mm) long, metallic green with red-brown wing covers, and have a series of white spots along the sides and tip of the abdomen. Pupae are cream-colored (sometimes with a red tint) and ^{½} inch (12.5mm) long, and larvae ("grubs") are white and range from $^{1}/_{16}$ to $1^{1}/_{4}$ inch (1.5 to 32mm) long.

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ces.ncsu.edu/ **Japanese-beetle adults** **(21)**

Adults attack foliage by chewing irregular holes in it, sometimes to the point that leaves are almost consumed. Foliage is skeletonized until there is no leaf tissue remaining between the veins.

ces.ncsu.edu **Japanese beetle damage**

Adult Japanese beetles are strong fliers and often appear suddenly; therefore, protecting foliage requires killing beetles quickly in the adult stage. **This is a pest to keep an eye out for as damage can be sudden.** Begin watching frequently when warmer weather arrives in early summer. Call your Extension Agent for best insecticide choices.

Home orchard growers are NOT advised to erect commercially available Japanese beetle "traps," as they often serve only to attract more beetles than they capture.

Powdery Mildew

Powdery mildew interferes with the proper functioning of leaves, reduces shoot growth, and can later reduce fruit set, and produces a netlike russet on the fruit of some cultivars. It is often a serious problem in apple nurseries and young orchard trees.

The first sign of powdery mildew in spring is a 3- to 4-day delay in the opening of infected buds. Leaves and blossoms of these buds soon become covered with a white to light gray powder, the spores of the powdery mildew fungus. On leaves of new shoot growth symptoms of powdery mildew appear as white patches on the margins and lower surfaces. Infected leaves curl upward and soon become covered with a powdery coating of spores. New infections of succulent leaves and growing shoots reduce the size of the entire shoot. By midsummer, leaves and shoots may turn brown and stop growing for the season.

Powdery Mildew *Sara Villani, NC State University*

Leaf and shoot infection may continue as long as shoot growth continues. Buds can become infected as they begin to form until they are matured for overwintering. Infections occur at temperatures of 65 to 80°F when relative humidity is high, such as at night. No moisture is required for spore germination to occur. **Consequently powdery mildew is often called the "dry weather" disease.**

For these reasons the growth rate of a young tree in the orchard can be heavily stunted. Commercial apple orchards often spray preventively for this disease. As a home orchard grower, scouting for this fungus can be important. At first sign of small stunted white leaves, contact your Extension agent for identification and management choices.

Fire Blight

Fire blight, caused by *Erwinia amylovora*, occurs sporadically in most apple orchards in the southeastern United States. It is not a major problem in many orchards in the WNC Mountains. However, on some varieties, when left unattended, can cause extensive damage to scaffold limbs and occasionally tree death.

Blossom blight is usually the first symptom observed in the spring. Flowers first appear water-soaked; then they wilt, shrivel, and turn brown or black. The bacterium moves down the peduncle into the fruit spur or branch, often girdling the branch and causing it to die.

Tips of shoots frequently droop to form a shepherd's crook and drops of ooze can often be seen along the infected shoots. Shoots also may be killed by infections that occur some distance back from the terminal. These infections girdle the twig, killing all tissues beyond the point of infection. Foliage often remains attached to dead twigs and shoots.



Shoot blight


Fire Blight Cankers *Sara Villani, NC State University*

Fire blight is very difficult for the home orchard grower to prevent, which involves very frequent spraying. So, early detection and rapid pruning response is important. To avoid downward movement into larger limbs, all fire blight affected tissues need to be removed from the tree and burned, or taken out of the orchard. Prune the infected shoots off 12 inches below the diseased tissue.

Dip pruning tools in isopropyl alcohol or Lysol (1/4 cup per gallon water) between cuts to prevent spreading the bacterium. Infection often follows spring storms with hail. However summertime fire blight infection called "shoot blight" can occur too, so continue watching for infection throughout the growing season. **If you have persistent Fire Blight issues in your orchard, call your Extension Center for new information about preventative spray treatments for Fire Blight.**

Throughout the life of your apple trees fire blight can cause "Cankers" in older woody shoots. They become a source for annual spring infections and can also can cause diseases like Black rot, and White rot. Rot diseases can cause severe damage to your apple tree over time.

During your annual dormant season pruning work, look closely for fire blight cankers and remove all the residual cankers. When dormant pruning and removal of fire blight cankers in January and February, it is safe to bypass the constant cleaning of tools.

Apple Pest Management - The Fruit Bearing Years

Now that you seeing fruit on your trees congratulations! However, don't start spraying because you think you are supposed to. First, see if your apple trees have any problems with any pest damage. If you find your apple quality doesn't meet your needs, then contact your Extension agent and bring several apples in for accurate identification. This is fundamental Integrated Pest Management, IPM. Your Extension Agent can help you with all the choices for managing any pests successfully starting the next year, and subsequent years.

Apple Scab

koppert.com

discover.hubpages.com

Apple Scab damage

Apple scab is caused by a fungal pathogen (Venturia inaequalis). The disease can negatively affect fruit size and quality. Due to the abundant rainfall and heavy humidity in our mountain area "Apple scab" can be one of our most common disease problems. Some apple varieties will never have apple scab, while others will likely have it. Choosing those varieties that are less susceptible is always a good idea. Your Extension agent has this variety susceptibility information.

Three IPM Cultural Practices that can help with Apple Scab

1. Prune well! Good air circulation helps to reduce apple scab damage. Good pruning practices can greatly reduce the apple scab damage on your fruit.

2. Apple scab inoculum on the leaves, travel to the ground in the fall season carried on the leaves. It spends the winter there; then floats up again in the spring to infect the new leaves. Wintertime removal of leaf litter will reduce apple scab infection for the coming year. Suggestions include raking up and disposing of leaves during the winter months.

3. Mowing and shredding the fallen leaves in winter months with a flail mower can also help to decompose the leaves and destroy some inoculum.

If you have apple scab as a persistent problem on particular varieties you can spray with fungicides and prevent some damage. If noticed, bring in damaged fruit in the summer or fall and have your Extension agent identify the damage. Then the agent can then help you with the best treatment choices for the coming year.

Cedar Apple Rust

Foliar CAR apple rust lesions.

CAR on fruit

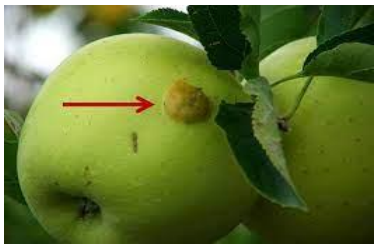
Sara Villani, NC State

If your location is above 3,000 ft. elevation, you are not as likely to have problems with the Cedar Apple Rust, because of the absence of cedar trees. Cedar trees are the alternate host for Cedar Apple Rust (CAR). CAR can be a common problem in home orchards "off the mountain". *Gymnosporangium juniperi-virginianae* is a heteroecious rust pathogen, meaning that two hosts are required to complete its two-year life cycle.

Cultural solutions may mean removing cedars and junipers within several hundred feet of your apple trees. Contact your Extension agent for detailed help with these decisions and fungicide application timing and materials. Some apple varieties are more susceptible and some resistant to CAR. If you are living in a region with endemic cedar tree populations, consider asking your Extension agent for a list of varieties that are more resistant to CAR.

Plum Curculio

Plum curculio (PC) is a pest of apples as well as pears, and other stone fruit crops. PC overwinters as an adult alongside woods, and then migrates into the edges of orchards, when temperatures exceed 60°-70 F, often during bloom. After petal fall, when small fruitlets have developed the females cut into small fruitlets and lay eggs in the cuts. The larvae may not successfully develop in apples since the eggs are usually crushed by the fruitlets as they grow. PC often causes only minor cosmetic damage for home apple orchards. However if damage becomes more serious, an insecticide treatment can be made effectively during the "petal fall" treatment window.




PC damage, light and heavy *Steve Schoof, NCSU*

Oriental Fruit Moth and Codling Moth

Codling Moth (CM) and the Oriental Fruit Moth (OFM) are fruit flesh eaters. These two pests often do not cause serious problems in small home orchards but when they do, you will know it!

Newly hatched CM and OFM larvae bite though the skin and quickly burrow into the flesh of the apple towards the core.


ucanr.edu ***left*** **CM and OFM damage** ***right*** *netreefruit.org*

The OFM overwinters in tree bark, dead leaves, or other debris as a fully-grown larva enclosed in a cocoon. In early spring, larva develops into pupae and emerges as adults in mid-March to early April, depending on location and weather conditions. After mating, females will lay up to 200 eggs that begin to hatch at petal fall. Larvae feed on shoot tips and inside fruit. There are typically four or five generations per season in the Southeast.

Similar to codling moth, OFM larvae bore into fruit and leave behind holes that are often filled with crumbly, brown frass (excrement). However, unlike codling moth, the tunnels they create inside the fruit often meander randomly and do not usually enter the core.

Larvae may also attack new leaf shoots, causing 'flagged' leaves and, in severe situations, stunt tree development. The key to managing these pests is proper identification and accurate timing of insecticide sprays. Use monitoring traps with insect specific pheromone lures to determine which pests are present at your location. However, traps do not catch enough adults to decrease damage to apples. Traps are used only to indicate when adults are flying and mating .

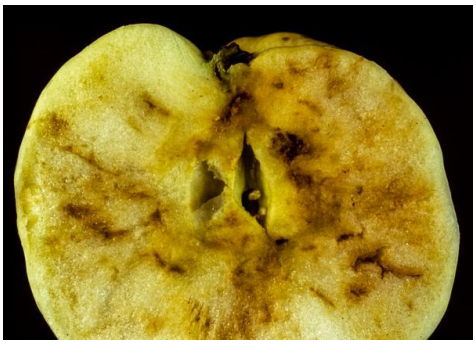
Codling Moth trap Walgenbach

If your fruit is damaged bring it in to the Extension office for positive identification. If you feel the impact is serious enough, you can prevent damage next year.

Apple Maggot (AM)

The apple maggot (*Rhagoletis pomonella*) or railroad worm is the most common fruit pest in home orchards. It is native to the Northeastern US and does its damage during mid to late summer. The apple maggot fly can begin laying her eggs in early-July in the mountain region. The resulting hatch of larva then feeds throughout the flesh of the apple creating a maze of small tunnels effectively ruining the fruit. Nothing can be done once the fly has laid her eggs. So preventing this infestation process is the key.

Severe AM damage



hort.extension.wisc.edu

Some varieties are susceptible and some are not susceptible to this pest. We suggest you monitor your fruit for the first years and have any damage identified by your Extension agent. The following year the apple maggot damage can be avoided. There are also ways for the home orchard grower to manage AM damage with opportunities to minimize insecticide use.

Sanitation for control

Many of the damaged apples will fall before ripening. Dropped apples should be picked up very soon after dropping, before the apple maggot larvae leave the fruit and enter the soil. Dropped fruit should be destroyed or deeply buried so the insects cannot successfully complete their life cycle. Sanitation is a key to limiting many apple pest problems.

Trapping for Control

If AM populations and damage is light, you can try "Red Ball Sticky Traps"; using 1-2 traps in a small tree (less than 8 ft. tall), 2-4 traps in a medium sized tree, and 6-8 traps in a large tree (20-25 ft.).

The traps should cleaned by removing the accumulated dead insects every couple weeks, and new sticky material applied if needed. If populations in the orchard are moderate or heavy, trapping alone is unlikely to provide adequate control.

Bagging for control

Studies have shown that developing apples can be protected from AM damage by bagging them when they are young. Sandwich-size plastic bags are used, with the opening stapled shut tightly around the fruit stem. A small slit is cut in the bottom corner of the bag to allow condensation to drain. The apples will mature normally, and will have a normal taste and texture. Applying these bags can be done as late as June. Commercial Japanese apple growers currently use this technique.

Spraying For Control

On larger trees, spraying may be a better choice. **At least one organic material is available and can be successful for apple maggot control.** It's based on naturally occurring kaolin clay that is mined and processed as a very fine powder. One trade name is Surround™. The powder is mixed with water and sprayed onto the trees, providing a "particle film" barrier that the insects dislike (it does not kill the insects). Multiple applications of Surround are often needed for AM control. In rainy weather re-application may be needed more frequently. Although not always 100% effective against AM; it may provide enough control for many home orchards. Using Red Ball Traps, as a monitoring tool, will help with timing the applications for better efficacy.

One problem using Surround is that it leaves a residue of white clay on the fruit surface which may need washing off using a fruit brush at harvest. Kaolin clay is considered non-toxic in the quantities used and can be used up to the day of harvest.

Historically apple growers have used a simple, often one time insecticide application, to control AM damage. Today new materials, non-restricted use products, are available to homeowners. Contact your Extension Agent for the choices best suited to your orchard.

Any spray application needs to be applied when traps indicate the AM population reaches treatment threshold numbers. Like with the Surround™ product, monitoring with Red Ball Traps will give you the best idea when to start any spraying.

Not finding enough AM maggot flies on the traps indicates there may be no need to spray at all.

Red Ball traps with lure attached -

AM Fly hort.extension.wisc.edu

Monitor by Trapping before Spraying

1. Begin about July 1st; monitor AM flies with **baited** Red Ball Traps treated with Tanglefoot. Yes baited; with a fruit essence lure purchased with the traps.

2. The apple maggot fly is about ¼ inch long, with a dark F shape on the wings.

3. Place traps in open spots in the tree, removing any apples with 18+ inches

4. Monitor traps weekly tracking the total flies found on each trap.

5. Catching 5 apple maggot flies per red ball trap indicates when treatment is needed.

If you find you have apple maggot damage, your Extension Agent will help you get started with AM trap monitoring. Systematic monitoring of traps, accurate identification of the AM and more is involved. It's quite interesting and not difficult to do.

Summary

Now that you are in the Fruit bearing time in your orchard, you may be hearing you should spray every year. **We suggest you practice IPM,** and don't start spraying because you think you are supposed to. Be patient; enjoy the new fruit reward of new apples on the apple tree! Just see if any of your apple varieties have a problem with insects or diseases.

If and when you start seeing fruit damage problems; then contact you Cooperative Extension Center and get the damage identified. Treatments can be offered and well timed applications for control can be planned. Many modern pest management products offer less toxic choices for control.

(30)

If you find your apple quality is being damaged more than you are comfortable with; then contact your Extension agent and bring several apples in for an accurate identification. Next year you can control the issue. This is fundamental Integrated Pest Management, IPM. Your Extension Agent can let you know all the choices for managing any pests successfully the next year and future years.

The pests presented in this document are the pests most often encountered in small home apple orchards. Be aware as there may be more unexpected pests and fertility problems. That is the nature of farming.

Integrated Pest Management – IPM

These practices and techniques are part of Integrated Pest Management

1. Soil sampling and long-term fertility planning and management.

2. Groundcover management and erosion control.

3. Scouting, trapping, and accurate identification of pests.

4. Use pesticides only when necessary and when damage exceeds data-based thresholds.

5. Use least toxic materials pesticides and consider all impacts.

Compiled by the Avery County Heirloom Apple Project -
Doug Hundley and Bill Hoffman - revised June 2025

Special thanks to Steve Schoof and Dr. Jim Walgenbach and the NC State Apple Program at the NCSU Mountain Horticultural Crops Research and Extension Center.

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https://adamapples.blogspot.com/

This is a great multi-year blog, firsthand accounts of many Heirloom apple varieties. Interesting reading!

Notes: