Introduction to vegetable gardening in North Texas

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What are we going to talk about today?

- Getting started
- Creating a plan
- Selecting varieties
- Planting and care
- Growing tomatoes
- Diagnosing and treating pests and diseases
Doctors, nutritionists and your Mother recommend eating more fresh veggies.

You can grow more than 100 different kinds of vegetables in North Texas.

You control the chemicals applied and their timing.

North Texas vegetable gardeners have two primary growing seasons—spring and fall.

The rest of the year...There are a few vegetables that produce during the summer and most cold weather crops can survive winters (except the really bad ones).
Five strategies for a successful vegetable garden

- Select varieties that grow well in North Texas
- Plant at the right time
- Grow your soil to feed your plants
- Make sure plants receive the correct amount of sunlight
- Pest control (do not create conditions that favor the bad guys. Focus on early detection and treatment)
Denton County Weather Facts

- Spring average last frost date (50% probability of no more frost): March 18
- Spring date of 90% probability no more frost: April 6
- Fall average first frost date (50% probability that a frost has occurred): November 15
- Fall date of 90% probability first frost: December 4
- Denton County is now within zone 8a for assessing cold hardiness of plants.

May 2015: 12 inches of rain fell on saturated soil
Control what you can

- Get your soil tested and add recommended amendments
- Add lots of organic material
- Choose varieties recommended for North Texas
- If in doubt, check soil temperature before planting sensitive vegetables or follow the recommended planting dates
- Use drip irrigation or soaker hoses to keep water drops off your plant leaves to reduce fungal infections
- Use mulch to control weeds, maintain moisture and mediate soil temperature
- Leave enough space between plants to allow leaves to dry
- Add some flowers to attract pollinators

Downy Mildew. Affects many vegetables and appears as a white to purple “downy” growth on the undersides of leaves and along stems. The best way to prevent downy mildew is to avoid water remaining on underside of leaves.
Accommodate or accept what you cannot change

- Weather
- Watering restrictions
- Unhealthy nursery plants
  - Before buying nursery plants: Check leaves (green and happy), roots (fill container but not circling the bottom), avoid tall, spindly plants
- Birds eating your seeds or damaging fruit
- Indestructible insects
- Herbicide drift from neighbors

You can minimize negative impacts and improve your chances of having a successful harvest!
Getting started

- Appropriate amounts of sun light and water are essential to your success.
- If you eat the fruit – give the plant full sun. If you eat only the leaves, a bit of shade is okay.
- Don’t go over board on garden size the first year or two. What is manageable in March can be overwhelming in July.
- If starting from scratch for a traditional garden, begin prep several weeks before adding plants or seeds.
Traditional (in-ground) row vegetable garden

- Rows can be as long as desired although bigger is not necessarily better.
- The greater size provides larger harvests.
- Wide rows, raised above the surface, help with drainage.
- Be sure to create pathways between rows for weeding and harvesting to reduce soil compaction.
Soil preparation for in-ground vegetable garden

Traditional

1. Clear the area of all vegetation.
2. Till to a depth of 8 inches
3. Layout rows and walkways (rows are 2-3 feet wide or up to 4 feet wide for wide-row gardens). Paths are 1 foot wide.
4. Use a shovel or hoe to move soil out of the paths and up onto the rows.
5. Add organic matter to the rows.
6. Flatten the row with a rake.

Alternative (no till method)

1. Clear the area of all vegetation. This can be done by covering with layers of newspaper, or cardboard covered with leaves and other organic materials. Or,
2. Dig up the top layer and turn it over exposing the roots of vegetation. Cut the sod into small pieces to speed decomposition.
3. Wait 4 to 8 weeks for the vegetation to die.
4. Add organic materials and work them into soil.
5. Flatten the area with a rake. Layout rows and walkways.

*Be aware:* Neither method is very successful in dealing with Bermuda grass. You can remove by frequent tilling, pulling or glyphosate, but it doesn't give up without a good, long fight.
The big deal about soil

A poor gardener grows weeds
A good gardener grows plants
A great gardener grows soil
Soil is not dirt

- Dirt is what people and pets bring into the house that needs to be cleaned up.
- Soil, with its organic material and microorganisms, contains EVERYTHING that plants need to grow. Soil should be treasured.
- Gardening soil should be loose enough that you can dig a planting hole with your hand.
Understanding a soil analysis report

To calculate the pounds of nitrogen:

Multiply 20 by .12, which equals 2.4

For 800 square feet of garden:

2.4 x .8 = 1.92

So, use just about 1/2 the bag
Add organic matter to transition your dirt into good soil

- Improves the ability of the soil to accept and store water.
- Increases the activity and number of soil organisms.
- Over time, a well-amended soil will supply all of the nutrients your plants require and reduce fertilizer requirements (except nitrogen).
- Although you might not expect it, adding organic matter to soil also helps to protect water quality and the environment by limiting chemical runoff into watershed.
- If using manure or hay, know the source. These herbicides: Aminopyralid, clopyralid, and picloram are registered for application to pasture, grain crops, residential lawns, commercial turf, .... According to North Carolina State University, these herbicides “can also remain active in the manure even after it is composted. The herbicides can also remain active in hay, straw, and grass clippings for an unusually long time.” (several years)
- How much? For vegetable gardens, add 6 inches of compost.
Soil additives

To add amendments recommended in your soil analysis report, mix into soil or planting hole:

- Rock phosphate (0-3-0). Be sure to double check the phosphate levels in your report before adding more as this mineral can remain in the soil over several years. (50 pounds per 1,000 square feet)

- Green sand for potassium (50 to 100 pounds per 1,000 square feet).

- Cottonseed meal (5-2-1) adds nitrogen and helps slightly acidify the soil. (2-4 pounds per 100 square feet)

- Most garden fertilizers have a ratio of nitrogen, potassium and phosphorous (NPK). These may be balanced (10-10-10) or weighted toward one element or another. (10-20-10 for example would have more phosphorous).

- All commercial chemical fertilizer bags have filler to help distribute the chemical evenly. The filler is usually about 70% of the total weight.
Organic soil amendments

- Fish meal—hydrolyzed fish fertilizer (approximately: 2-4-1) plus some proteins and minerals to feed soil microorganisms. Almost no smell (as opposed to fish emulsion).
- Bone meal—source for phosphorous
- Blood meal—source of nitrogen. Be aware this smells a bit the first few days and may attract critters.
- Molasses—dry from feed stores or specialty nurseries or dilute store-bought (1 to 2 tbsp. per gallon) feeds microorganisms.
- Sea minerals or rock powders (ex: SEA-90, azomite)
- Animal poo — bat, gerbil, rabbit, chicken and manure okay if properly composted. Dog, cat or human not okay because even high-temperature composting may not kills all parasites.
Tips for adding mulch

Because mulch is less decomposed than compost and could absorb nutrients meant for plants, it should be placed on top of the soil. It should surround the plant but not touch the stems.

**How much?** Add 3 inches of mulch on top of soil to moderate temperature, limit weeds and conserve water. Organic mulch breaks down into compost to feed soil.

Pine bark, straw, or wood chips are recommended. Hay may be used but be cautious. Not only can hay bales contain weed seeds, they may contain herbicide residue that will kill your vegetable plants.

Plastic mulch may be used. HOWEVER, it does not decompose to feed the soil and must be removed annually during bed preparation.
The raised bed alternative

- Mounded soil or framed about 9 to 12 inches deep

Advantages:
- Excellent drainage
- Discourages aggressive grasses
- Can be tall enough to reduce bending and stress on the lower back
- Can be just functional or an attractive landscape addition
- Less soil compaction
- Fewer soil-borne weeds
How to build a raised bed frame

Construct the frame with a nontoxic building material, such as stone, cinder blocks, bricks, untreated wood or fiberglass. (*Some garden centers and catalogs sell raised bed frames ready for assembly.*)

Make sure the frame is sturdy enough to hold together when filled with soil.

If using boards, secure them at the corners with metal braces, or use screws or nails to secure the boards to a reinforcing block of wood inside the corners.

Or use rebar posts to support frame. Drive posts into the ground to brace the boards at the corners and every 3–4 feet, on the outside of the box. Do not nail or try to fasten screws into the ends of the boards - they will split. *Boards 2 – 3 inches thick will last much longer than 1-inch boards.*

If using concrete blocks, offset placement to provide more stability and reduce soil loss.
Preparing raised bed for planting

- Place a layer of cardboard on the bottom to keep sneaky weeds and grasses with deep roots from invading your garden space. Cardboard will decompose in a few weeks. (See previous note about Bermuda grass)

- Add gardening soil and compost or potting soil. Use a soil volume calculator to determine how much soil you need.

- Layout watering system if using drip irrigation or soaker hoses.

- Add 2 to 4 inch layer of mulch.

- If following a square-foot garden design, add grid (usually wood slats) to control plant spacing.

- Soil test the second year. Continue yearly testing until soil tests well then every couple years after that.

![Soil Calculator](image_url)
The down-side of raised-bed gardens

- Initial cost of materials
- Good for drainage but a raised bed dries out more quickly than in-ground gardens
- Need to add minerals to most imported potting soil
- Soil becomes hot during the summer. This can be mitigated by the use of 3-4 inches of mulch on top of the soil and using a shade cover.
- Plants that require lots of growing room, such as melons, may not fit into a raised bed.
Growing vegetables in containers

- Many types of containers can be used to grow vegetables and herbs.
  - Buckets
  - Planters
  - Pots
  - Even the sacks that soil comes in
  - Express your creativity

- Be sure the container has a drain hole.

- Check moisture frequently as containers dry out quickly.

- Move containers to provide proper sunlight as sun angles change with the season.
Container vegetable gardens

- Select pots that provide enough depth for plant roots to grow down and spread out.
- Make sure the pot or container is clean. (You can sterilize a container by soaking it in a mixture of 1 part bleach to 9 parts water. Let set for 10 minutes. Rinse with water and a bit of dishwashing detergent followed by rinsing in clean water.)
- Choose a light weight potting mix such as one with a portion of perlite.
- Fill a clean container to within one-half inch of the top with a slightly damp soil mixture. (Peat moss in the mix will absorb water and mix much more readily if soaked in water before putting the mix in the container.)
Deciding what to plant can be challenging
Select vegetables you and your family will eat.

Note the mature size of the plant to ensure enough garden space for growth and air-drying of leaves.

Check available sunlight. Remember sun angle changes throughout the year. Sun-loving plants need 6 to 8 hours of sunlight per day.

Use pencil and paper or one of the free on-line garden planning applications (Resources). Place plant IDs and locations on your plan.

Generate a list of transplants and seeds to purchase.

When this is outside, stay warm beside a nice fire and plan next spring’s garden.
Beginning gardeners often do best with proven varieties. Not everything that grows in a vegetable garden will do well in North Texas.
Varieties recommended for North Texas

Vegetable Variety Selector

Recommended Bean Varieties for Denton County

<table>
<thead>
<tr>
<th>Variety</th>
<th>Days to Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Lake</td>
<td>60</td>
</tr>
<tr>
<td>Derby</td>
<td>57</td>
</tr>
<tr>
<td>Dwarf French Tendergreen</td>
<td>55</td>
</tr>
<tr>
<td>Early Contender</td>
<td>55</td>
</tr>
<tr>
<td>Festina</td>
<td>56</td>
</tr>
<tr>
<td>Florence</td>
<td>60</td>
</tr>
<tr>
<td>Goldcrop Wax</td>
<td>55</td>
</tr>
<tr>
<td>Improved Golden Wax</td>
<td>52</td>
</tr>
<tr>
<td>Jade</td>
<td>60</td>
</tr>
<tr>
<td>Long Tendergreen</td>
<td>50</td>
</tr>
<tr>
<td>Maxibel</td>
<td>60</td>
</tr>
<tr>
<td>Nash</td>
<td>54</td>
</tr>
</tbody>
</table>

And many more...

Recommended Cucumber Varieties for Denton County

<table>
<thead>
<tr>
<th>Variety</th>
<th>Days to Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calypso</td>
<td>52</td>
</tr>
<tr>
<td>Carolina</td>
<td>49</td>
</tr>
<tr>
<td>H-19 Little Leaf</td>
<td>55</td>
</tr>
<tr>
<td>Sumter</td>
<td>50</td>
</tr>
<tr>
<td>Diva</td>
<td>58</td>
</tr>
<tr>
<td>Spacemaster</td>
<td>55</td>
</tr>
<tr>
<td>Sugar Crunch</td>
<td>57</td>
</tr>
<tr>
<td>Suyo</td>
<td>61</td>
</tr>
<tr>
<td>Sweet Slice</td>
<td>62</td>
</tr>
<tr>
<td>Sweet Success</td>
<td>55</td>
</tr>
<tr>
<td>Sweeter Yet</td>
<td>50</td>
</tr>
</tbody>
</table>
# Seeds versus transplants

<table>
<thead>
<tr>
<th>Vegetables to direct sow seeds</th>
<th>Vegetables that can go either way*</th>
<th>Vegetables to transplant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arugula</td>
<td>Lettuce</td>
<td>Broccoli</td>
</tr>
<tr>
<td>Beans (pole and bush types)</td>
<td>Spinach</td>
<td>Brussels Sprouts</td>
</tr>
<tr>
<td>Beets</td>
<td>Chard</td>
<td>Cabbage</td>
</tr>
<tr>
<td>Carrots</td>
<td>Kale</td>
<td>Eggplant</td>
</tr>
<tr>
<td>Peas (Southern and sweet)</td>
<td>Squash</td>
<td>Leeks</td>
</tr>
<tr>
<td>Radishes</td>
<td>Cucumbers</td>
<td>Peppers</td>
</tr>
<tr>
<td>Turnips</td>
<td>Melons</td>
<td>Tomatoes</td>
</tr>
<tr>
<td>Corn</td>
<td>Leeks</td>
<td>Cauliflower</td>
</tr>
<tr>
<td>Okra</td>
<td></td>
<td>Asparagus (crowns)</td>
</tr>
</tbody>
</table>

* Allow 3 to 4 weeks to reach size of transplants.

*Exceptions:* potatoes grow from seed potatoes, sweet potatoes grow from slips and garlic from cloves.
If planting from seed

- Check the seed packet instructions for planting depth, distribution, thinning, day to maturity, size and harvesting.
- Soak large seeds overnight. Small seeds can be soaked for a couple hours.
- Level the soil and dig a straight trench to the desired depth.
- Distribute seeds as evenly as possible. Sometimes it helps to mix small seeds with course sand or corn meal.
- Pat soil firmly to ensure contact with the seed.
- Moisten the soil and keep it damp until leaves emerge.
- Soon after seedlings grow their second set of true leaves, thin them out to recommended spacing.

Helpful information from seed packet

- Look for the year the seeds were packed, usually printed or stamped on the envelope (will appear as "sell by" or "grown for").
- How far apart to space seeds within a row, the depth for sowing the seeds, days to germination, and instructions for thinning seedlings.

* University of Georgia Extension service
Soil temperature needed

- Soil temperatures should be taken by inserting a soil thermometer 3 to 4 inches deep into the soil surface.
- Soil thermometers are available from garden centers, feed and seed stores, and from many garden supply catalogs.
- Soil temperatures should be consistent for several days before seeds are sown to ensure that the seeds are being exposed to optimal temperatures for germination.

Resources provides a link to recommended spring and fall planting dates for North Texas
If planting vegetables from transplants

- Purchase or grow your own indoors. (Small nurseries may have a better variety of locally grown transplants.)

- Make sure your transplant has healthy foliage, no lesions or brown spots on the stems. Pull plant from growing container and check to make sure the roots are not pot bound (wrapped around each other).

- Soak plant in container an hour or two before planting. Transplant on a shady day or in early evening.

- Dig a hole large enough to hold the roots of the plants. Set the plants level with the ground and firm soil. *Tomatoes are an exception discussed later*

- Add a cup of weak starter solution such as manure or compost tea or fish emulsion.

- Protect plant from wind until roots establish. Water daily for the first week.
More about ambient temperature affects

- **Cool season veggies:** 
  **Optimal growing temperatures** day: 60-70°F night: 50-60°F

- **Warm season veggies:** 
  **Optimal growing temperatures** day: 70-80°F night: 60-65°F

- **Vegetables that can withstand light frost:**
  Artichokes, bokchoy, cauliflower, celery, Chinese cabbage, peas, quinoa, and radicchio.

- **Vegetables that can withstand hard frost:**
  Arugula, broccoli, Brussels, beets, cabbage, lettuce, carrots, spinach, Swiss chard

**Frost** - temperature is expected to fall to between 33 and 36 degrees F. Frost develops if there is water vapor in the air.

**Freeze** - temperature between 28 and 32 degrees F.

**Hard Freeze** - when the temperature falls below 28 degrees F.

**Freeze warnings** mean temperatures will be below freezing for a sufficient amount of time to do damage to vegetation.
Container growing vegetables

Vegetables that can be grown in containers include tomatoes, peppers, eggplant, green onions, beans, lettuce, squash, radishes and parsley.

Pole beans and cucumbers require support because of their vining growth habit.

What about tomatoes?
- Patio varieties
- Cherry (sweet 100, sun gold)
- Successfully growing tomatoes in containers is possible, but challenging

<table>
<thead>
<tr>
<th>Table 1. Varieties for Container Grown Vegetables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broccoli (2 gallons, 1 plant)</td>
</tr>
<tr>
<td>Carrot (1 gallon, 2-3 plants. Use pots 2 inch deeper than the carrot length)</td>
</tr>
<tr>
<td>Cucumber (1 gallon, 1 plant)</td>
</tr>
<tr>
<td>Eggplant (5 gallons, 1 plant)</td>
</tr>
<tr>
<td>Green Bean (2 gallons minimum, space plants 3 inches apart)</td>
</tr>
<tr>
<td>Green Onion (1 gallon, 3-5 plants)</td>
</tr>
<tr>
<td>Leaf Lettuce (1 gallon, 2 plants)</td>
</tr>
<tr>
<td>Parsley (1 gallon, 3 plants)</td>
</tr>
<tr>
<td>Pepper (5 gallons, 1-2 plants)</td>
</tr>
<tr>
<td>Radish (1 gallon, 3 plants)</td>
</tr>
<tr>
<td>Spinach (1 gallon, 2 plants)</td>
</tr>
<tr>
<td>Squash (5 gallons, 1 plant)</td>
</tr>
<tr>
<td>Tomato (5 gallons, 1 plant)</td>
</tr>
<tr>
<td>Turnip (2 gallons, 2 plants)</td>
</tr>
</tbody>
</table>

* Texas A&M AgriLife
Fertilizer Application*

- Soil type dictates the frequency for fertilizer application. Sandy soils require more frequent applications and lower amounts of nitrogen and other nutrients than do clay type soils.

- Check fertilizer label for recommended frequency of application for specific vegetables.

- A general rule of thumb is that nitrogen is for leafy top growth; phosphorus is for root and fruit production; and potassium is for cold hardiness, disease resistance, drought tolerance, and general durability.

- **CAUTION:** If tomatoes and other nightshade plants are fertilized too heavily with nitrogen, the plant may be all vines and no fruit. A nitrogen application will have its greatest effect for 3 to 4 weeks after application.

* http://aggie-horticulture.tamu.edu/vegetable/guides/texas-vegetable-growers-handbook/chapter-iii-soils-fertilizers/
Be aware of potential phosphorus buildup in your soil*

- Too much phosphorus reduces plant’s ability to use essential micronutrients and unlike nitrogen, phosphorus remains in the soil for a long time.

- Phosphorus buildup is caused by excessive use of inorganic fertilizer or the use of composts and manures high in phosphorus.

- If soil test shows high levels of phosphorus, do not add more.

- Symptoms of high phosphorus include shallow rooted annuals or yellowing of young leaves with or without necrotic spots suggesting iron/zinc deficiency.

- Research shows that soil-applied iron is rapidly tied up by North Texas alkaline soils and its availability is limited. Under high phosphorus conditions, both iron and zinc are quickly converted to non-available forms. Foliar iron and zinc applications, however, work well.

Fertilizing during plant growth

- **Sidedress**: Apply on both sides of the row 6 to 8 inches from the plants. For established vegetable gardens, if nitrogen was not applied before planting, apply half the recommended rate as a side dress immediately and then the other half after a couple weeks (Cornell University extension).

- **Foliar Feed**: Use when a quick growth response is wanted; micronutrients (such as iron or zinc) are locked into the soil; or when the soil is too cold for the plants to extract or use the fertilizer applied to the soil. Absorption begins within minutes after application and is completed within 1 to 2 days. Foliar fertilization can be a supplement to soil fertilization at a critical time for the plant, but is not a substitute.

- At transplanting time, an application of phosphorus spray will help in the establishment of a young plant in cold soils.

- When using a foliar spray for secondary and trace nutrients, add 1 teaspoon of a liquid dishwashing detergent per gallon of solution or add a commercial surfactant at the recommended rate to break the surface tension of the solution and prevent beading on the foliage.

- Apply only the spray volume needed to wet the foliage without dripping or running liquid off the leaves.
Cool weather and warm weather crops

**Plant in Cool weather**
- Salad greens
- Garlic
- Potato
- Cruciflers
- Onion
- Beet
- Carrot
- Peas

**Plant in Warm weather**
- Tomato
- Eggplant
- Pepper
- Squash
- Melon
- Cucumber
- Bean
- Corn
Plant care for salad greens

Leaf lettuce
Romaine
Spinach
Mesclun
Chard
Arugula
Tatsoi

- Ideal ambient temperatures are 40°-75° F
- Add supplemental water when soil dries out at 1 inch depth (finger test or moisture meter)
- Fertilize with blood meal, fish meal, cottonseed meal or pre-mixed 10-5-5 chemical fertilizer
- **Pests and diseases** for greens include: Aphids, Leafminers, Leafhoppers, Cabbage looper, Cutworms, Slugs, Downy mildew, Mosaic Fusarium. Follow Integrated Pest Management Guidelines (Resources) for controls.
- Leaves may be harvested individually from the outside of the plant or the entire plant may be harvested when outside leaves reach the desired size.
Crucifer (Cabbage family) plant care

- Select transplants rather than seeds (except radishes)
- Plant from September thru February.
- Heavy feeders. Use frequent, small applications of nitrogen-rich fertilizers.
- Requires only small amounts of supplemental water when conditions are very dry.
- Prone to a variety of pests and diseases.

Cabbage
Broccoli
Cauliflower
Brussels sprouts
Turnips
Bok choy
Kale
Kohlrabi
Radish
Collards
Mustard
Plant care for warm weather crops

- Mulch to moderate soil temperatures and moisture.
- Water when soil is dry about 1-inch below the surface. It is the plant’s roots that need water. Water in the early morning.
- The extreme Texas heat brings less variety for summer harvest crops.
- Many warm-weather crops, such as tomatoes, stop producing in the heat. If the plants survive into the fall, sometimes you get a second crop. However, the best-practice recommendation is to use new transplants.
- Shade cloth may help a bit if placed on the southwest side but you will have more success selecting heat-tolerant varieties.
All about growing tomatoes

- Favorite crop of North Texas home vegetable growers.
- Select varieties recommended for North Texas usually small to medium-large work best for new growers.
- Always buy the healthiest plants you can find—dark green leaves and stocky stems. No sign of leaf curling, brown patches or holes. About 4 to 6 inches tall is best.
- Plant in a location that receives at least 6 to 8 hours of sunlight per day. Full sun is okay.
- Plant middle to the end of March and be prepared to cover the plants if a frost or freeze is forecast.
- Tomatoes usually do not set fruit when temperatures exceed 90 degrees (or below 50 degrees).
- Tomatoes have both male and female blossoms but require a natural (or man-made) breeze for pollination. (sometimes pollinating insects help)
Recommended tomato varieties for North Texas

Heirloom:
- Cherokee Purple
- Green Zebra
- Roma
- Texas Wild Cherry Tomato
- Yellow Pear
- Black Krim

Hybrids:
- 444*
- Celebrity
- Carnival
- Sweet 100
- Juliet
- Fourth of July
- Sun Gold
- Tycoon*
- Texas Superstar

Tycoon, the new Texas Superstar, can produce tomatoes as large as one pound or heavier. The fruit tends to be oblate rather than round. (Texas A&M AgriLife Extension Service photo)

This list is a good starting point but is not all inclusive. For more choices, ask your gardening neighbors or a local nursery for more recommendations.
Understanding tomato plant tags

Heirloom versus hybrid:

• Heirloom tomatoes, or “open pollinated” tomatoes, are varieties that have been reproduced for generations. Many gardeners believe that heirloom tomatoes have better flavor than hybrids. Heirlooms have not been bred for disease resistance. Heirloom seeds breed true.

• Hybrid tomatoes are those that have been bred and selected for their disease resistance and productivity. They are the first-generation cross between two “pure” parental lines. Seeds from a hybrid tomato do not breed true.

Determinate versus indeterminate:

• Determinate varieties of tomatoes, also called "bush" tomatoes, grow to a compact height of about 4 feet. They stop growing when fruit sets and ripen all their crop within about 3 weeks and then die.

• Indeterminate varieties, also called "vining" tomatoes, grow and produce fruit over a longer period of time. The plants can grow up to 10 feet and require a support structure. They bloom, set new fruit and ripen fruit at the same time throughout the growing season.

Disease resistance information: VF (Fusarium wilt and Verticillium wilt fungi resistance), VFN (plus root-knot nematode resistance) and T for tobacco mosaic virus resistance.
How to plant tomatoes

- After preparing the soil, Dig the hole 3 to 4 inches deeper than necessary and add recommended amounts of additives and mix.

- Cover with 2 inches of soil.

- Set the plant 2 inches deeper than the container depth or

- If leggy make the planting hole horizontal, remove the lower branches and lay out the plant leaving about 4 inches of green growth above the soil.

- Firm soil gently over roots and water the soil (not the plant leaves).
Caring for young tomato plants

- If cutworms have been a problem in the past, wrap the lower stem a couple inches with aluminum foil.

- If planting early, have a protection plan in case of a late frost or freeze.
  - Hoops with row cover
  - Milk bottles with warm water then cover
  - Milk bottles with bottom removed set over the plant
  - Blankets held around but not touching
  - Commercial protectors such as cozy coats or wall-of-water
  - Frost cloth

- Do NOT expect a layer of clear plastic to protect against frost – it won’t.
Caring for the maturing tomato plant

- Provide support to keep plant upright, promote air circulation and not allow ripening tomatoes to rest on the ground attracting bad guys.

- William Adams in Tomato Lovers Handbook recommends cages built with cattle or hog panels (heavy gage, welded steel available at Feed stores).

- Sturdy tomato cages can be purchased but stay away from the flimsy circular ones for indeterminate tomatoes.

- Until roots are established provide wind protection by wrapping cages with frost cloth or plastic wrap.

- For heirloom varieties fertilize after the tomatoes have small clusters or if plant appears spindly.

- For hybrids, add fertilizer monthly with foliar spray.

- No hard and fast rule – about two inches of supplemental water per week when actively growing.
The Enemy: pests and diseases
Insect pests

- There are many insects that like your vegetable fruit and plants.
- There are also beneficial insects that can help in the fight and should not be victimized.
- Identify problems early by inspecting your plants every day—see Resources for sites with pictures of pests and their damage to correctly identify the culprit. For identification purposes insects may be grouped by:
  - Type of damage—sucking, chewing, soil dwelling
  - Location of damage—roots, fruit, leaves
  - Vegetable variety vulnerability
- Follow Integrated Pest Management guidelines to remove pests—See Resources.
- You will lose some battles.
Insect damage examples

Chewing damage from cabbage looper

Sucking damage from lacewing
What is integrated pest management (IPM)

**Integrated Pest Management** (IPM) is a strategy used to manage insect pests in the landscape by using economically and environmentally sustainable practices.

The goal of IPM is *not* necessarily to eradicate or eliminate pests, but to strengthen and stabilize the landscape (ecosystem) so that conditions are favorable for plants but unfavorable for pests.

IPM is a continuum of action moving from least toxic to plants and wildlife to more toxic.

IPM begins with good **cultural** practices such as plant varietal selection, weeding, watering, creating habitats for beneficial insects and nutrient management.

**Mechanical** IPM includes removing insects by hand, using traps and spraying with a hose to remove aphids and mites.
Biological practices include using one organism to control another, as in attracting or releasing beneficial insects that are natural enemies of pest species into the landscape and protecting the beneficial insects that exist in the landscape.

Chemical practices least toxic include selecting natural biological insecticides such as Bt, insecticidal soap, horticultural oils, neem oil, spinosad, diatomaceous earth.

The most toxic chemical alternative are insecticides such as: malathion, imidacloprid, carbaryl. These also kill beneficial insects. May be hazardous to humans and pets.
Aphids

There are several different types, varying in color. Blasts of water or insecticidal soap aimed at the underside of the leaves can help limit the numbers of aphids. Aphids are a favorite food for ladybugs and especially ladybug larvae. Use a row cover to physically keep the aphids off vegetable crops. If using chemical insecticides – FOLLOW DIRECTIONS.
Adult leafminers are 1/16 inches in length with grayish-black bodies and yellow markings. The female lay eggs into the leaves of plants. The whitish-yellow larvae then cause damage by tunneling through the leaf tissue. As the larvae mature, the white tunnel or mine gets larger in size. Cultural controls include pruning and disposing of infested leaves and branches and covering the soil with plastic to prevent larvae from pupating. Chemical Control Options include organic sprays such as horticultural oil, neem and spinosad.
Rogues gallery — 3

**Tobacco and tomato hornworms** are the common 3 to 4 inch caterpillars that defoliate tomato and related plants. They can strip a plant of foliage in a short period of time. A gardener can remove manually by pulling off the plant. Birds and predatory wasps can help, too.
Rogues Gallery – 4

Practically unstoppable

Grasshopper

Potato beetle

Squash vine borer
About plant diseases

- Disease can affect leaves, stems, fruit or roots.
- Disease may be caused by bacteria, viruses or fungi culprits.
- Check plants routinely for leaf spots, wilts, dead areas and misshapen leaves.
- Some diseases are abiotic (meaning they are caused by environmental factors rather than pathogens.
- If different types of vegetables across an area are sick, this suggests an environmental cause such as: soil fertility, too much water, too little water or herbicide damage.
Vegetable plant diseases

Plants from the same family often are susceptible to the same diseases. Examples of plants by family are as follows:

- **Cabbage family:** broccoli, Brussels sprouts, cabbage, cauliflower, Chinese cabbage, mustard greens, kohlrabi, radish, rutabaga and turnip
- **Cucumber family:** cucumber, cantaloupe, gourds, muskmelon, pumpkin, squash and watermelon
- **Nightshade family:** eggplant, pepper, potato and tomato
- **Beet family:** table beet and spinach
- **Legume family:** beans and peas
- **Carrot family:** carrot, celery and parsnip
- **Onion family:** chive, garlic, leek, onion and shallot

* University of Missouri extension
Oh, woe is me – what can I do?

- Be vigilant
- Diagnose before treating
- Protect beneficial bugs and pollinators by spraying or dusting when there is no wind and during early evening hours when bees are not foraging.
- Do not spray when plants are in bloom.
- Follow instructions on package or container!

Help is here!

(Best in class) University of California IPM is organized by the types of vegetable impacted and provides pictures of the damage, of the culprits and offers treatment options. [http://ipm.ucanr.edu/PMG/GARDEN/veggies.html](http://ipm.ucanr.edu/PMG/GARDEN/veggies.html)

“Guidelines for Identification and Management of Plant Disease Problems: Part II. Diagnosing Plant Diseases Caused by Fungi, Bacteria and Viruses” ([http://edis.ifas.ufl.edu/mg442](http://edis.ifas.ufl.edu/mg442))

Insects in the city ([http://citybugs.tamu.edu/](http://citybugs.tamu.edu/))
It is worth it!

Photo: bbrown
Resources and references

**Denton County Master Gardener North Texas Gardening**: http://dcmga.com/north-texas-gardening/

**TAMU Soil Analysis Lab**: http://soiltesting.tamu.edu/

**Soil report interpretation guidance**: http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/22023/ec1478.pdf

**Soil quantity calculator**: http://www.gardeners.com/how-to/soil-calculator/


**Vegetable Variety Selector by County**: http://aggie-horticulture.tamu.edu/publications/veg_variety/

**Vegetable varieties for North Central Texas**: http://agrilifecdn.tamu.edu/urbantarranthorticulture/files/2010/06/Vegetable-Varieties-for-North-Central-Texas-1.pdf

**Integrated Pest Management Guidelines for Texas**: http://vegetableipm.tamu.edu/


**Vegetable Gardening in Containers**: http://aggie-horticulture.tamu.edu/vegetable/files/2010/10/E-545_vegetable_gardening_containers.pdf
More resources for North Texas vegetable gardeners

- **Easy Gardening series**: Tips on planting and caring for commonly grown vegetables. [http://aggie-horticulture.tamu.edu/vegetable/](http://aggie-horticulture.tamu.edu/vegetable/)
- **Landscape IPM**: [http://landscapeipm.tamu.edu/what-is-ipm/ipm-concepts/](http://landscapeipm.tamu.edu/what-is-ipm/ipm-concepts/)