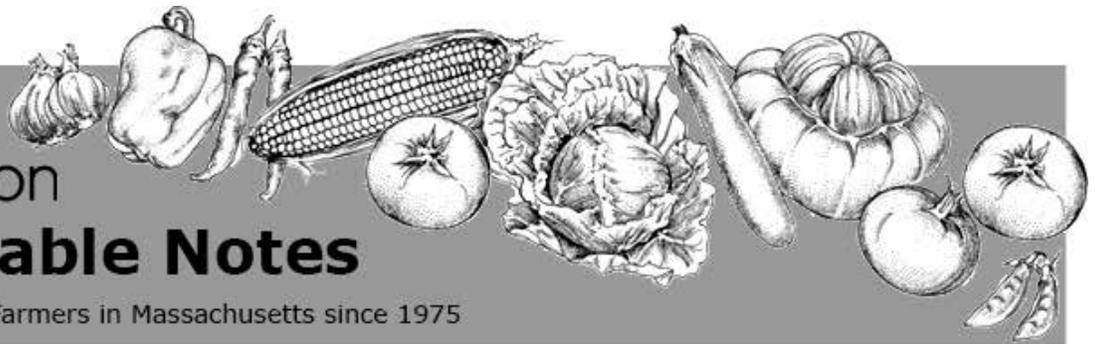




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# Vegetable Notes

For Vegetable Farmers in Massachusetts since 1975



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## CROP CONDITIONS

Bulk harvests of onions, sweet potatoes, leeks, and potatoes are underway, in between sudden and sometimes severe rainstorms. When doing fieldwork during stormy weather, we often find ourselves wondering what structures are safe (or not) to shelter in when lightning is passing by. We found [this article from Growing For Market](#) to be most informative, and hope it will help you make better decisions about getting yourself and your crew to safety! Folks are taking advantage of sunny windows to clean up weedy fields before the battle is lost, and using rainy times to trim garlic and onions curing indoors. Tomatoes, peppers, eggplants, cukes, squash, and all the summer staples are still cranking along and farmers are not feeling excited about losing some of their summer farm help when school starts up in the next week or two. But for now, things are looking good out there and we are all glad to have a drier August than last year when 8-17" of rain was dumped on us in just a few weeks.

We were also glad to have nice weather this Tuesday for our annual Research Farm Tour—we had a great turnout and a real nice time learning about the diversity of research happening out at the farm and hearing from farmers about their interests and issues, thanks to those who made it out! Stay tuned for details about our next twilight meeting, which will be about managing animal pests in the packhouse with an eye toward food safety.

## PEST ALERTS

### **Beets & Swiss Chard:**

[Cercospora leaf spot](#) has been building up in beets and chard all season—unmanaged beet crops may have nothing more than a few crispy leaves at this point. Implementing cultural controls that decrease leaf wetness periods, like increasing between-row and decreasing in-row spacing to improve air-flow, using drip instead of overhead irrigation, and managing weeds, can help decrease the severity of this disease. Fungicides can effectively control this

disease. Researchers at Cornell recommend: propiconazole (Tilt), or benzovindiflupyr + difenoconazole (e.g. Aprovia Top). For organic growers, copper + Double Nickel provided good control in trials. For more detailed fungicide recommendations and a list of tolerant beet varieties, see the article in the June 27, 2019 Issue of Vegetable Notes.

### **Brassicas:**

[Caterpillars](#) and [flea beetles](#) are continuing to do damage in brassica plantings—newly transplanted seedlings and root crops that are emerging now are especially vulnerable. All four of the most damaging caterpillar pests have been observed now in MA: imported cabbageworm, diamondback moth, cabbage looper, and cross-striped cabbageworm. Spray for caterpillars at a 15% threshold for leafy crops or headed crops and at a 35% threshold for heading crops that have not yet formed heads. For small plants, <12" tall, treat for flea beetles when there is an average of 1 flea beetle per plant or damage exceeds 10%.



*At this Tuesday's research tour, Dr. Lynn Adler told the group about her research on disease transmission in bees and how it can be used to better understand human disease transmission.*

*Photo: G. Higgins*

[Alternaria](#) is continuing to spread throughout infested fields and pop up in new fields. This pathogen is spread by wind, splashing water, insects (especially flea beetles), equipment, and workers, and is favored by the type of weather we've had recently—60-78°F and long periods of leaf wetness. Control is difficult for organic growers. DoubleNickel or other Bacillus-based fungicides + copper can be effective against *Alternaria* spp. and other fungal and bacterial diseases in other crops but has not been studied in brassicas. Azoxystrobin (e.g. Quadris) is commonly used for control in conventional production—resistance to azoxystrobin is widespread in New York. See the New England Vegetable Management Guide for other labeled fungicides. Controlling flea beetles can help slow the spread of this disease.

### Cucurbits:

[Downy mildew](#) arrived in western MA this week, putting all of southern New England, VT, NH, and western ME at high risk for disease development. Early stages of infection were observed in trial plots in Hampshire Co., MA on 'Marketmore 76' cucumber, which has no resistance to new strains of the pathogen. Other outbreaks near MA have been on cucumber (New York, Long Island) and butternut squash (Rhode Island). With the frequent storms this week, it's likely that the disease will spread quickly. Ideal spray programs for management of cucurbit powdery (PM) and downy (DM) mildews should now include a protectant fungicide (e.g. chlorothalonil, mancozeb, copper) as well a targeted DM material and a targeted PM material, applied weekly. To best prevent the development of resistance to fungicides, rotate between two DM materials and two PM materials.

For current recommendations for managing cucurbit downy mildew, see [Guidelines on Managing Cucurbit Downy Mildew in the Northeastern USA in 2019 Based on Recent Research](#) from McGrath of Cornell University. A list of targeted materials is linked to on page three of that article, as well as here.

For current recommendations for managing cucurbit powdery mildew, see [Managing Cucurbit Powdery Mildew Successfully in 2019 in the Northeast Region of the US](#).

[Striped cucumber beetle](#): The second generation of SCB is emerging now and beginning to do damage. This generation can damage foliage and transmit bacterial wilt, same as the spring generation, but will also feed on fruit, damaging the skin. Many growers do not actively treat for SCB in the late-summer/fall because plants are generally big enough to withstand some feeding damage. Sprays targeted at squash bug may help manage SCB as well.

[Squash vine borer](#) is continuing to cause plants to collapse. Once larvae are inside the stems they are protected from sprays and difficult to control. In small plantings, pull infested plants and squish larvae before they exit the stem to pupate in the soil to reduce the size of the next generation. In larger plantings, till under crop residue thoroughly and deeply to destroy larvae and reduce the survival of overwintering pupae.

### Eggplant:

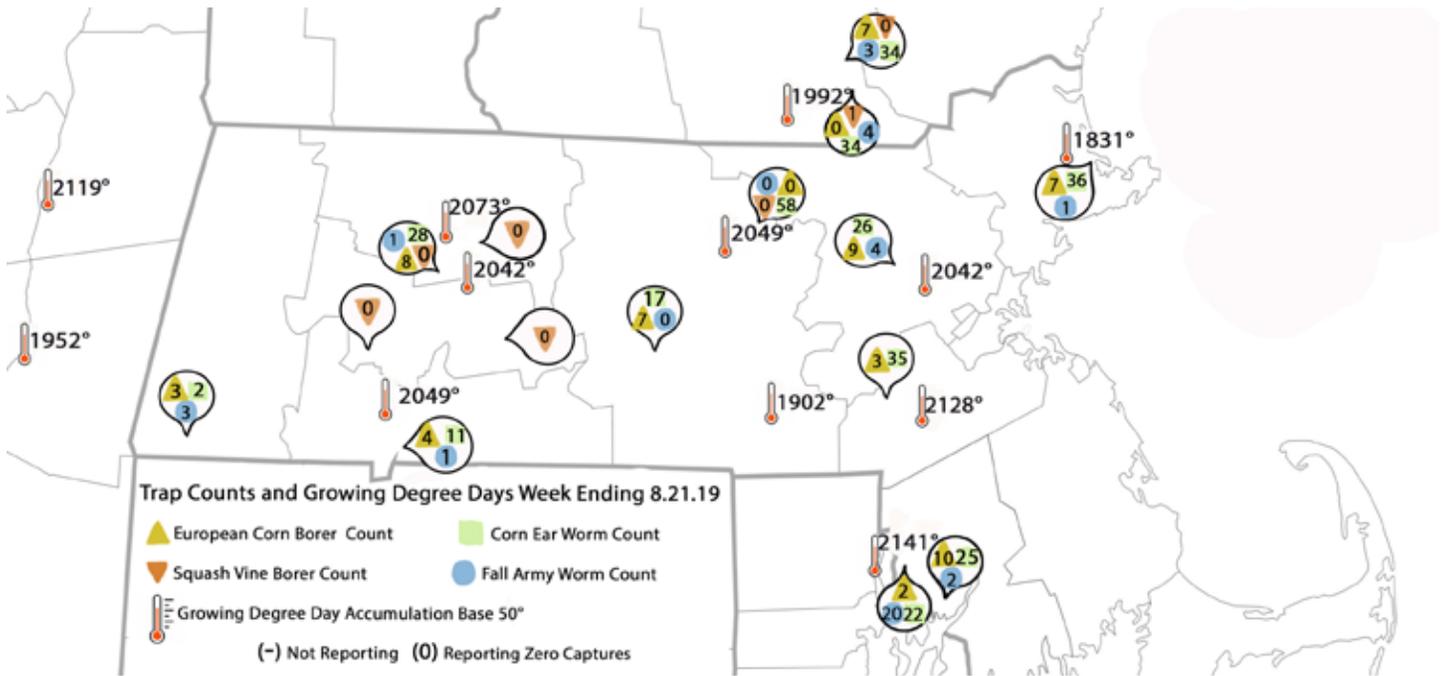
[Colorado potato beetle](#): Next generation CPB adults, eggs, and larvae were observed this week in New Hampshire. Scout eggplant now to catch this generation early on, when treatment is most effective. Do not treat this generation with spinosad (e.g. Entrust) if spinosad was used on the first generation. Azadirachtin and pyrethrins can both provide effective control if good foliar coverage is achieved. Azadirachtin is a growth regulator—larvae will not die immediately but will die at their next molt. Pyrethrin (e.g. Pyganic) is a contact insecticide. Spray pyrethrins late in the day, as they break down quickly in UV light. Other synthetic insecticides include Group 28 materials e.g. Coragen or Exirel. Treatment threshold for eggplant is 4 small or 2 large larvae per plant.

### Sweet Corn:

[Corn earworm](#) trap counts remain in the double-digits throughout MA, putting most trapping locations on a 4-day spray schedule. Continue spraying until 5-7 days before final harvest or until silk is completely dry and brown. See



*Cucurbit downy mildew symptoms on cucumber. Photo by S.B.Scheufele*



map and table.

**Fall armyworm** numbers are still low—in the single-digits with one exception in Bristol Co., MA with 20 moths captured this week. Most areas are on fairly tight CEW spray schedules at this point, which should control FAW as well, so most growers are not spraying whorl-stage corn but focusing on spraying silking corn.

**European corn borer** is still flying in some parts of the state, while the 2nd flight seems to be done in other parts of the state. ECB should be cleaned up with CEW sprays at this point as well.

Spray Intervals for corn earworm based on moth captures in *Heliothis* net traps.

Moths/Night	Moths/Week	Spray Interval
0 - 0.2	0 - 1.4	no spray
0.2 - 0.5	1.4 - 3.5	6 days
0.5 - 1	3.5 - 7	5 days
1 - 13	7 - 91	4 days



## **PUMPKIN & WINTER SQUASH HARVEST, CURING & STORAGE**

It might feel a little early to be thinking about winter squash, but we’re seeing fruit at various stages of ripeness out there and, in a year marked by frequent rains, folks might be starting to make plans for getting crops out of the field. Winter squash and pumpkin fruits that remain in the field face a daunting list of diseases, insects, and weather events that could threaten fruit quality. Once the fruit reaches maturity, prompt harvest and careful postharvest handling is generally preferable to leaving fruit in the field, especially if wet weather is in the forecast and/or if your pumpkins or squash are in fields that were previously infested with *Phytophthora* blight, which can explode after a heavy rain.

**Pumpkin Harvest Timing:** Since the pumpkin market lasts from Labor Day to Halloween, pumpkins may need to be held for several weeks before they can be sold. One factor in deciding when to harvest is the condition of the vines. Intact foliage protects fruit from the sun, and when vines and foliage go down from powdery or downy mildew, fruit can get sunscald. Foliar diseases, especially powdery mildew, can also reduce quality of pumpkin handles, leading to reduced

marketability for jack-o-lantern pumpkins. As September approaches, the other major factor in deciding when to harvest is avoiding chilling injury. Chilling hours accumulate when squash or pumpkins are exposed to temperatures below 50°F in the field or in storage. Injury increases as temperature decreases and/or length of chilling time increases. This is particularly important for squash headed into long-term storage.

There can be extra work involved in bringing fruit in early and finding good storage locations, especially for growers who normally have pick-your-own harvest. However, we recommend that growers harvest as soon as crops are mature and store under proper conditions, if it is feasible. Proper curing and storage conditions are key for pumpkins in particular, because improper conditions can result in handles shrinking and shriveling, making the pumpkins unmarketable. If you need to hold fruit in the field for pick-your-own or any other reason, using a protectant fungicide (e.g. sulfur, oil, or chlorothalonil) along with one of the targeted powdery mildew products can help protect from black rot, powdery mildew, and other fungal fruit rots (see article in this past [Veg Notes issue](#)). Scout for insects feeding on the fruit and handles, which may include squash bug nymphs and adults, and striped cucumber beetles, and control them if damage is evident. See the [New England Vegetable Management Guide](#) for treatment recommendations.

**Harvest:** Despite their tough appearance, squash and pumpkin fruit are easily damaged. It is important to avoid bruising or cutting the skin during harvest. Once the rind is bruised or punctured, decay organisms will invade the fruit and quickly break it down. Place fruit gently in containers and move bins on pallets. Use gloves to protect both the fruit and the workers. For some squash, especially butternut, stems can be removed to prevent them from puncturing adjacent fruit during harvest and storage. If stems are removed, allow the stem scars to heal before putting into storage (see Curing Conditions below).

**Harvest Timing for Eating Quality:** For pie pumpkins and winter squashes, harvest timing determines the flavor and texture of the fruit. Before understanding when the best time is to harvest squash, it's important to understand the difference between "mature" squash and squash that is ready to be eaten. As squash fruits grow, they accumulate starch, which is then converted into sugar both during maturation in the field and after harvest during storage. The balance of starch (texture) and sugar (sweetness) in a squash determines the eating quality. Squash is "mature" when seeds are completely filled. If squash is harvested before it is mature, the fruit will use starch reserves from the flesh to fill the seeds, resulting in poor flesh quality. Immature squash will also not have enough starch to convert into sugar later on. For some squash types (e.g. acorn and delicata), the mature fruit can be eaten immediately after harvest. Other squash types (e.g. butternut, hubbard, kabocha), need more time to convert starches to sugars and must be stored for specific amounts of time before they are eaten.

Most squash varieties are mature and ready to be harvested 50-55 days after fruit set, or days after pollination (DAP). In many varieties, this is many weeks after the fruit turns a marketable color, which can be misleading. According to Dr. Brent Loy, researcher emeritus at the NH Agricultural Experiment Station, days to maturity listed in seed catalogs are often incorrect, especially for acorn squash; catalogs often state 70-76 days to maturity (from time of seeding) when in reality it's more like 90-100 days to maturity. It's not necessarily easy to keep track of fruit set, so there are some other indicators—see the end of this article for more information about specific varieties.

**Curing Conditions:** In some cases, squash needs to be stored for a short period of time (5-10 days) at a high temperature (80-85°F) and 80-85% relative humidity immediately after harvest, either in the field if weather allows, or in a well-ventilated barn, greenhouse, or high tunnel. Night temperatures should not drop below 60°F. These conditions will speed up the conversion of starches to sugars to achieve good eating quality earlier on and will allow fruit skin to harden and wounds to heal. You may not want to cure squash if it's destined for long-term storage and if it is free of wounds—squash in long-term storage should have sufficient time to convert starches to sugars and can go directly into storage conditions without the extra boost. Squash types like acorn and delicata are ready to eat at harvest (if they're harvested when they're mature!) and only need to be cured if you want to store them and the skin is wounded.

**Storage:** Pumpkins and winter squash should be stored in a cool, dry, well-ventilated storage area. Store fruit at 50-60°F with 50-70% relative humidity. Chilling injury is possible at temperatures below 50°F, and long-term storage at temperatures above 60°F will result in weight loss due to increased respiration rates. Large fluctuations in temperature favor condensation on fruit within the bin, which encourages disease. Therefore, fruit temperature should be kept as close to the temperature of the air as possible to avoid condensation and fruit rot. Relative humidity above 70% provides a favorable environment for fungal and bacterial decay organisms, and relative humidity below 50% can cause dehydration and

weight loss. In a greenhouse, temperature can be managed with ventilation on sunny days; heaters will be needed for storage into November and beyond. An inner curtain can reduce heat loss and cost.

Storage life depends on the condition of the crop when it comes in and your ability to provide careful handling and a proper storage environment. All fruit placed in storage should be free of disease, decay, insects, and unhealed wounds. See the end of this article for maximum storage times for different types of squash. Fruit that has been exposed to chilling temperatures (below 50°F) will not store well and should be marketed first.

Few farms have the infrastructure to provide ideal postharvest conditions for all of their fall crops. Fortunately, finding a method that is ‘good enough’ often does the job. Even if it is difficult to provide the ideal conditions, storage in a shady, dry location, with fruit off the ground or the floor, is preferable to leaving fruit out in the field.

***Cucurbita pepo* (acorn, delicata, sweet dumpling, some pie pumpkins):** Acorn squash turns dark green 2-3 weeks after fruit set, which is 40-50 days before it should be harvested. Because acorn squash can be marketed as soon as it turns dark green, regardless of eating quality, many acorn varieties will never accumulate enough starch and will therefore never be sweet. UNH has developed two varieties, ‘Honey Bear’ and ‘Sugar Dumpling’, that both have high sugar content at harvest. Harvest *C. pepo* squashes when the ‘ground spot’ (the part of the squash that lays on the ground) is dark orange. Pie pumpkins should be harvested when the skin is fully orange. These varieties can be eaten at harvest and will store for 2-3 months.

***Cucurbita maxima* (kabocha, hubbard, buttercup):** Stems becomes dry and corky when the fruit is ready to be harvested. These are more susceptible than other squash to sunburn and so if vines go down from disease, they should be harvested early (40 DAP), cured, then stored at 70-75°F for 10-20 days to achieve acceptable eating quality. These have high starch content at harvest and so need to be stored for 1-2 months before being eaten, with the exception of all mini-kabochas and all red-skinned kabochas, which can be eaten at harvest. They will store for 4-6 months.

***Cucurbita moschata* (butternut, some edible pumpkins):** Butternut will turn tan 45 DAP but should not be harvested for another 2 weeks. Mini-butternut can be eaten at harvest and will store for 3 months. All others should be stored 1-2 months before eating to allow for starches to be converted into sugars and will store for 4-6 months. Carotenoid, the pigment that gives squash its yellow/orange color, also increases in storage for these squash, giving them more color and making the more nutritious.

*--Written by G. Higgins and R. Hazzard, compiled 2018 from Eating Quality in Winter Squash and Edible Pumpkins and The Nuts and Bolts of Fruit Quality in Cucurbits by Brent Loy researcher emeritus, New Hampshire Agricultural Experiment Station and professor emeritus of genetics, UNH.*



*Suspended bird netting keep deer out of a lettuce field at Book and Plow Farm in Amherst, MA. Photo by G.Higgins*

## **PREVENTING DEER DAMAGE**

Massachusetts is home to a robust deer population whose feeding in vegetable and fruit crops can cause economic losses. While there are some crops that deer might not prefer, they tend to like many of the same foods that we do. Cabbage and other cole crops, lettuce, beans, as well as developing melon and pumpkin fruits are all particularly susceptible to deer feeding now. Though deer will taste many different plants, and will eat almost any plant if they’re hungry enough, there are a few crops that are considered unattractive to deer, such as strong-smelling plants like onions, garlic and fennel, nightshades like tomatoes and eggplants, and prickly plants like cucumbers and globe artichoke. As is also true for humans, rhubarb leaves are toxic to deer (though that doesn’t necessarily mean they won’t eat them if they’re hungry!). If there are wood-edged areas of your farm that are particularly at risk for deer inva-

sion, consider planting some of the less attractive crops in these fields. If you can't keep them out with unappealing crops, there are several other options available for managing deer damage on your farm. Factors such as the amount of crop land that you're trying to protect and the time and resources available will determine which options you choose.

**Row cover or netting** can keep deer out of vulnerable crops. Floating row covers over hoops work well, but can be a lot to manage and may add unnecessary heat at this point in the season. Wider mesh netting can be used either as fence, or as row cover, and can be applied over a crop with a perimeter of T-posts (see photo).

**Temporary electric fencing** is the most cost-effective measure to prevent deer damage. Deer can jump over fences that are 7 feet or higher. Electric fences are generally installed well below this height and so work as mental barriers more than physical ones. They rely on deer's poor depth perception and habitual behaviors to confuse and deter deer.

For small fields of a few acres or less, portable fences of electric wire, woven rope, or tape will provide relief from deer. Solar or battery-powered chargers make it possible to set up a fence even in remote locations. Woven ropes and tapes enhance protection by being very visible to deer, even at night, while providing an electric shock on contact. Deer perceive black and white rather than color and more readily see objects that are moving, so fences that contrast to the environment and have movement—you can tie black and white fabric or mylar strips to the fence—will be more easily seen. Such fences are also more visible to people. As few as two strands of electric wire can be used to protect crops; three strands are better. In a two-wire fence, the first wire should be at a height of 10-12 inches and the second at 30-36 inches. A three-wire fence can have strands at 12, 24, and 40 inches. Double fences—that is, two fences in parallel, spaced about 3-5 feet apart—can be very effective if deer are jumping over a single fence. The outer fence can be a single strand at approximately 36 inches. Multi-strand fences can also be installed at a 45-degree angle, which will help to deter deer from attempting to jump over the fence. (See Resources section below for links to more in-depth descriptions of various temporary and permanent fence designs and materials).

Deer are well insulated over most of their body with fur, dampening the shock of an electric fence. Baiting the fence, with store-bought lures or a piece of aluminum foil smeared with peanut butter, will entice the deer to contact the fence with its more sensitive nose and tongue, and help to educate a deer to respect the fence. Space the bait about 3 feet apart around the perimeter and keep the fence baited for at least a few weeks after the fence is installed. Be sure to regularly check the strands to ensure that they have adequate charge—about 2.5 kilovolts for a baited fence. Portable voltage readers can be purchased for as little as about \$10-\$20. Make sure fence lines are well maintained as weeds or grass touching the wires will reduce the charge. Electric fence supplies can be found easily on the internet, at farm supply centers or through fencing specialty companies. Electric fences work best when deer are tentative and moving along an unfamiliar path. To get the deer to investigate a new area and contact electrified bait, you may need to disrupt their normal path by placing logs or brush along the route and forcing them to approach the fence from a different point.

**Permanent fencing** is the most effective long-term solution to deer damage. In this case the fence creates a barrier rather than just a deterrent. A non-electric fence should be at least 8 feet high and either have a lower bottom wire than a movable electric fence—about 6 inches off the ground—or be of mesh construction. Permanent fencing, usually high tensile woven wire fence, can be expensive to install but cost-effective in the long run as it only needs to be put up once and is very effective at keeping deer (and other animals) out of fields. You may wish to consult a professional fence installation company (e.g., River Valley Fencing, Wellscroft, Northeast Farm and Fence Service). In Massachusetts, the Department of Agricultural Resources (MDAR) has grant programs such as the [Agricultural Food Safety Improvement Program \(AF-SIP\)](#) that can help fund the installation of wildlife fencing. Contact Laura Maul ([laura.maul@state.ma.us](mailto:laura.maul@state.ma.us), (617) 626-1739) for more information on this and other agricultural grant programs.

Fence maintenance is critical in both applications. If a tree falls on the fence or a hole is cut in the fence, it should be repaired immediately. Once deer have gotten inside and discovered the crop, it will be harder to keep them out, even with an electric fence. No gaps should exist in the fence; access must be provided through gates that are closed at all times. Fences should have a clear outer perimeter, at least 5 or 6 feet on the outside of the fence, so deer have to cross an opening before encountering the barrier. This enhances visibility of the fence to the deer and provides the deer with a route to escape so that it doesn't jump over the fence just to get away from the shock. Deer will blunder into a fence placed tight to a wooded edge and can actually damage or take down sections of a fence simply because they do not see it very well, especially with smooth wire designs. Having a clear border will increase the effectiveness of the fence and aid in maintenance. Permanent tall wire fences while more expensive may be a worthwhile investment on the home farm, or where

you will always be planting vulnerable crops. Moveable electric fences make sense in fields that are rented, far from the home farm, or are planted to different crops each year.

**Scare devices** can be effective when deer populations and pressure are fairly low. There are devices that make noises, squirt water, give off bright light, or are made to look like predators. Some are motion sensitive. Placing these tools at field edges where deer are entering can help to scare them off, and can be used in addition to fencing. Deer get accustomed to these devices pretty quickly, though, so they must be moved frequently.

**Repellents** reduce deer damage by making the target crop taste or smell unpalatable to deer. All repellents are billed to reduce, not eliminate, deer damage and don't provide reliable protection when deer densities are high. To achieve this reduction, they must be consistently applied and reapplied as directed. Once a feeding pattern has been established, repellents are usually less effective. Repellents fall into three categories: taste, odor, and combination taste and odor. Different formulations allow the user to change the repellent and keep the deer on guard by providing a change in the range of odors and tastes.

For protecting vegetable and fruit crops, make sure that a product is approved for use on edible crops. Certain taste-based repellents can be used on edible plants such as vegetable crops, fruits, berries, nuts and herbs, but they must be washed off prior to eating. The following repellents are among those approved for use on edible plants: Hinder (ammonium soaps of higher fatty acids; *labeled for apple, pear, and carrots only*), Millers' Hot Sauce (capsaicin), Deer Stopper (putrescent egg solids, rosemary and mint oils), Deer Off (putrescent egg solids, capsaicin, garlic oil). Some growers report that foliar applications of fish emulsion, which is sold and applied as a nutrient supplement, have an additional benefit of repelling deer. There are also numerous home-made products that may work as repellents.

Repellents should be applied before damage is likely to occur, when precipitation is not expected for 24 hours, and temperatures will remain between 40° to 80°F for that period. Hand-spray applications may be cost effective on small acreages, while machine sprays will reduce costs for larger areas. If the materials are compatible, spray costs may be reduced by adding repellents to pesticide sprays.

Maintaining optimal densities of deer populations through habitat management and hunting can help to keep deer pressure in vegetable crops low. The Massachusetts Division of Fisheries and Wildlife sets management goals and regulates hunting during three designated seasons. For more information on white-tailed deer and this control strategy, see the official Massachusetts website on Deer Management at <http://www.mass.gov/eea/agencies/dfg/dfw/fish-wildlife-plants/mammals/deer-management.html>

#### **Resources for deer fencing design and construction:**

- North Carolina Wildlife Resources Commission, [Fencing to Exclude Deer](#)
- VerCauteren, K. et al., [Fences and Deer-Damage Management: A Review of Designs and Efficacy](#), Wildlife Society Bulletin (2006).
- Buskirk, D., [Deer Barriers...Fencing, Repellents, Dog Restraint Systems](#), Michigan State University Bulletin (2002).
- Craven, S. & Hygnstrom, S., ["Deer", The Handbook: Prevention and Control of Wildlife](#), Internet Center for Wildlife Damage Management (1994).

--Written by L. McKeag and R. Hazzard with thanks to the following sources: : John E. McDonald, Jr., formerly US Fish & Wildlife; Craig Hollingsworth, University of Massachusetts; Richard Ashley and Norman L. Gauthier; University of Connecticut; Maryland Dept of Agriculture (<http://www.dnr.state.md.us/wildlife/ddmtrepell.asp>); Massachusetts Division of Fisheries and Wildlife; <http://www.electric-deer-fence.com>; growers who build deer fences.

## **FALL WEED MANAGEMENT ADVICE**

Every year, summer crops start to come in, on top of spring crops that are still holding on, on top of fall crops that need to be planted, and somewhere along the way, weed management seems to get pushed to the back burner. Weeds that were missed a few weeks ago are starting to seem unmanageable now and it may seem like it's the end of the road for certain fields, in terms of weed management. Not so! There are three main activities that need to be completed now for good,

year-round weed management—fall field scouting, preventing weed seed production, and controlling perennial weeds.

**End of Year Weed Scouting.** It is worthwhile to take the time to check fields for weed problems as fall gets closer and the field season begins to wind down. A quick scouting can identify problems that will be expensive to solve if they get out of control and can provide clues that will help in designing a weed management program for next year. Mapping weedy spots, and keeping some kind of permanent record of weed surveys, can help you evaluate your weed management over the years. Make a map of each field and fill in the following information:

**How many?** If weeds are very dense, they may be having an impact on yields. This is especially true if these weeds emerged early in the season, when competition is greatest. If weeds were actively growing during the period of greatest crop growth, consider changing the weed management program.

**Which weeds?** Identifying weeds can help identify potential problems before they get out of hand, and can help you decide if you need to modify your weed control program. Weeds like yellow nutsedge, field bindweed, and quackgrass are spreading perennials that have underground parts that enable them to spread throughout whole fields. Because these weeds can be very damaging, and are very difficult to control, they are worth investing more time and resources into controlling when they are young or appearing in a field for the first time. In addition, keep an eye out for annual weeds that are new to a field or are increasing in numbers. Some weeds can be very difficult to control in some or all of the crops in your rotation. Galinsoga, for example, is hard to control in brassicas, peppers, and squash. Nightshades are difficult to control in tomatoes and other solanaceous crops for growers who rely on herbicides because they are all in the same family. Velvetleaf is hard to control in sweet corn.

**Where are the weeds?** Weeds in the rows or planting holes are much more damaging to crop yields than between-row weeds. Weeds in rows may be an indication that cultivation equipment needs adjustment, or cultivation needs to be done earlier.

**What worked?** It is also useful to look at the whole field and evaluate the effectiveness of your weed control efforts. If some weeds are generally escaping, identify them. They may point to weaknesses in your herbicide or cultivation program. If mostly grasses or mostly broadleaves are escaping, it may require an adjustment of either the rates or the timing of grass or broadleaf herbicides. You may also find the New England Vegetable Management Guide useful. This manual contains a chart listing the effectiveness of vegetable herbicides on most of the common weeds in New England. Use this guide to find an herbicide labeled for your crop that might give better control than the one that was used.

**Preventing Weed Seed Production.** Annual weeds produce incredible amounts of seeds. Annual grasses normally produce 3,000 to 5,000 seeds per plant, small-seeded annual weeds such as pigweed and lambsquarters can produce 100,000 to 250,000 seeds per plant, and larger-seeded broadleaf weeds such as velvetleaf and smartweed can produce 5,000 or more seeds per plant. Perennial weeds can also produce seeds, in addition to surviving through other storage structures like rhizomes or tubers. Once fields are harvested, they should be tilled or disked as soon as possible to prevent seeds from maturing. Be especially concerned with weeds that are new to a field or are in abundant supply. If time is short, one alternative is to mow the weeds. This will remove the primary seed stalk. It will also, however, encourage lateral branching and eventually, these branches will produce seeds and must be destroyed. For some weeds, like Galinsoga, seed maturation may continue after mowing or pulling—these plants should be removed from the field if possible.

**Perennial weed management.** The best time to control perennial weeds is in the fall. All perennial weeds have storage structures (taproots or rhizomes) below ground that enable these plants to survive the winter and regenerate themselves the following year. Fall tillage of perennial weeds will kill top growth and fragment the storage organs but will not kill the weed. Frequent tillage will, over a long period, control perennial weeds but, in most cases, this is not practical.

Perhaps the best control technique for perennial weeds is an application of glyphosate (Roundup) before the plant goes dormant. Perennial broadleaf weeds such as bindweed or dandelion should be sprayed while they are still actively growing which is usually before a hard frost. Perennial grasses, such as quackgrass, can be sprayed as late as mid-November. Use 10 to 20 gallons of water per acre when spraying glyphosate. Two quarts of the herbicide will provide much better control at 10 gallons of water per acre than at 40 gallons of water per acre. Spraying on a mild afternoon following a cold or cool morning is best to encourage translocation of the herbicide to the belowground storage structures. Disking or tilling two weeks after application will also improve control of the weeds.

Many growers fight perennial weeds such as quackgrass in corn fields year after year because their primary goal in the fall is to plant a cover crop. This is usually followed by a spring application of glyphosate, which provides top kill but does not kill the whole weed. Applying glyphosate at the proper time is key. Delaying the seeding of a cover crop may be a necessary evil in the fight against perennial weeds.

In conclusion, remember to scout and map your fields, prevent weed seed production, and apply glyphosate at the right time to control perennial weeds. [See article below for more on late-season weed control.–Ed.]

*--Rich Bonanno, former UMass Extension Weed Specialist (now Associate Dean, CALS and Director, NC State*

## **WHEN THE TIME COMES TO HAND PULL WEEDS**

Prolific weeds like horseweed (aka mareetail) and pigweeds [also grasses, lambsquarters, galinsoga...] are beginning to flower and will drop hundreds of thousands of seeds per plant in the coming weeks. Those seeds will stay in the soil and cause increased weed problems in future years. At this point, what can you do?

While the best time to manage these prolific weeds is prior to planting, some stubborn plants can remain in and around fields through the late-season. Potential reasons for this include 1) ineffective herbicide control, 2) herbicide resistance, 3) small stands persisting on field edges, roads, and by buildings, 4) plants that are cut off during small grain harvest that recover, branch out, and push on to produce seeds.

At this point in the season, a grower's first reaction to escaped weeds may be to reach for herbicides. However, growers cannot simply rely on herbicides to control large plants (over 6 inches) which are typically able to survive or outgrow herbicide damage. This is where the integration of manual removal may come into play to avoid spreading thousands or millions of seeds.

Options for managing mature weeds: Growers aiming to eliminate individual mature weeds have several options, all with pros and cons that the grower must weigh.

First, they may be manually pulled using a hoe, weed hook, or by hand. Pulled plants should be moved out of the field to prevent regrowth and seed drop. While certainly time-consuming, physically removing the plants is the most definite way to ensure they cannot contribute to the weed seed bank, and this can save lots of money in the long run.

A second option for late-season management is to mow the area of the field that contains a severe infestation. If the weeds have not yet produced seeds, this should substantially decrease the quantity of dropped seeds. The grower would need to weigh the cost of terminating the crop where the infestation exists, but should keep in mind that preventing this weed infestation now can save a substantial amount of money on weed control next year.

Third, when faced with a severe mature infestation that has produced seeds, a grower may choose to not only mow the affected section of the field, but also burn the mowed weeds in piles or windrows. Burning this weedy plant matter at sufficiently high temperatures kills the weed seeds. Temperatures of 800-900 degrees F are required to kill most weed seeds. In order to achieve this temperature range, it is important to form the plant matter in windrows or piles and then wait for it to dry, in order to create the density and dryness needed.

Windrows may also be formed at harvest-time and then burned. This technique is referred to as "narrow windrow burning." It is becoming widely adopted in Australia, and is being tested by Virginia Tech and the University of Arkansas for use in US cropping systems.

While late-season control measures are labor-intensive, eliminating escaped weeds is an important measure for preventing seed dispersal and new infestations, especially in no-till fields. Just a few plants can produce enough to infest an entire field in a couple of seasons. Manual removal this year could save significant money, time, and labor in future years.

*--Re-published from the USDA-ARS Integrated Weed Management Resource Center, <http://integratedweedmanagement.org/index.php/2017/08/11/when-the-time-comes-to-hand-pull-weeds/>*

# EVENTS

## [Massachusetts Tomato Contest to be Held on Tuesday, August 27<sup>th</sup>](#)

The 35<sup>th</sup> Annual Massachusetts Tomato Contest will be held in the [KITCHEN at the Boston Public Market](#) on Tuesday, August 27<sup>th</sup>. Tomatoes will be judged by a panel of experts on flavor, firmness/slicing quality, exterior color and shape. Four categories: Slicing, Cherry, Heirloom, as well as Heaviest! Always a lively and fun event, the day is designed to increase awareness of Massachusetts grown produce.

Farmers who will join us in Boston can bring tomatoes to the market between 9:00 am and 10:45 am on Tuesday, August 27<sup>th</sup>, or can drop tomatoes off with a registration form to one of the **drop off locations on August 26<sup>th</sup>**. These tomatoes will be brought to Boston. For the complete details, including drop off locations, contest criteria and a registration form, [click here](#).

**Can't make it to Boston? Drop-off your tomatoes at one of the regional drop-off locations in Great Barrington, West Springfield, Worcester, Topsfield or North Easton on Monday, August 26<sup>th</sup>.**

*The 35<sup>th</sup> Annual Tomato Contest is sponsored by the Massachusetts Department of Agricultural Resources, New England Vegetable and Berry Growers Association, and Mass Farmers Markets in cooperation with the Boston Public Market and The Trustees.*

## Attorney General Meeting on Overtime Ruling

**When:** Friday, September 13th at 1pm

**Where:** Nourse Farms in Whately

“Farmers are invited to a meeting with State Representative Natalie Blais, The Secretary of Labor and Workforce Development’s office, and the Attorney General’s office to discuss the implications of the recent Chang Farm ruling by the Massachusetts Supreme Judicial Court (SJC). The meeting will occur on Friday, September 13th at 1pm at Nourse Farms in Whately.

In March, the SJC ruled that workers involved in on-farm “preparation for market” activities are not exempt from overtime pay while doing tasks that are considered “preparation for market”. It had been the understanding for many years that market preparation was exempt from overtime requirements.

This ruling has had significant implications for many farms across the Commonwealth. The Attorney General’s office is responsible for enforcing these policies. At the request of State Representative Natalie Blais, staff has agreed to meet with local farmers to give an overview of overtime rules and regulations and will do their best to answer questions to help you to understand the application of the ruling. The Attorney General’s office will do their best to answer questions and provide clarification on the grey areas that exist in regards to what constitutes “preparation for market” activities versus other farm tasks which are covered by the overtime exemption.

Please note that the purpose of this meeting is not to discuss or argue the merits or logic of the SJC ruling as the ruling is beyond the control of these offices. Rather, this meeting is intended to help you gain a clearer understanding of the implications of the ruling and how it will be enforced.

If you would like to attend please RSVP by September 9th, 2019 to [lily.wallace@mahouse.gov](mailto:lily.wallace@mahouse.gov)

Any questions, please contact Brad Mitchell, MA Farm Bureau, at 508.481.4766

## [Northeast Mechanical Weed Control Expo](#)

**When:** Thursday, September 12, 2019

**Where:** University of Maine Rogers Research Farm, 914 Bennoch Rd. (Rt. 16), Old Town, ME

**REGISTRATION:** [Click here to register for this event online](#). \$20 on or before September 5. \$30 from September 6-11. \$40 on day of event. Pre-registration required. Registration is limited, so register early to assure a spot. No refunds can be offered for registrations made by check OR after September 5, 2019.

The Northeast Mechanical Weed Control Expo will feature tool demonstrations and research results for both vegetable and grain production. Hand-tools, walk-behind tractors/tool carriers, and tractor-mounted equipment will be on display and demonstrated in the field, and will include equipment from Terrateck® and Johnny’s Selected Seeds, HAK®, Tilmor®, K.U.L.T.-Kress®, Garford®, Treffler® Harrows, and Franklin Robotics. We invite farmers of all levels of

experience and production to participate. The day will include:

Research presentations and posters

Field demonstrations of tools for small-, mid- and large-scale growers

Friendly competition testing your weed knowledge and cultivation skills!

Plenty of time to connect with fellow growers, researchers, and industry representatives

*The Northeast Mechanical Weed Control Expo is supported by grants from the USDA-NIFA Organic Agriculture Research and Extension Initiative (OREI) and the Northeastern IPM Center.*

### [Vermont Vegetable & Berry Growers Association On-Farm 2019 Workshop Series](#)

The Vermont Vegetable & Berry Growers Association is holding a series of nine on-farm workshops from June through November this year. For more information on all workshops in this series, please click the linked event title above.

Attendance at these events is free for members of the Vermont Vegetable & Berry Growers Association. The cost is \$10 per-person for non-members, payable on-site. Refreshments will be served. Membership in the VVBGA costs \$55 per farm, per calendar year. The VVBGA works with University of Vermont Extension to deliver education and applied research for its growers.

**Wednesday, September 25, 3-6 pm.** Mighty Food Farm, 280 Rod and Gun Club Rd., Shaftsbury, VT 05262. Lisa MacDougall grows vegetables, berries and cover crops on 20 acres of hillside land and in five high tunnels for CSA and wholesale markets. She will host a tour of her new wash/pack facility with Chris Callahan and Andy Chamberlain on hand to discuss design considerations. Vern Grubinger and Becky Maden will assist with discussion of fall cover crops, nutrient management, erosion control, and high tunnel vegetable production.

**Questions?** Contact Vern Grubinger, 802-257-7967 x303. To request a disability-related accommodation, contact Dana Rupert, 802-257-7967, three weeks prior to an event so we may assist you.

## **THANK YOU TO OUR SPONSORS:**



*Vegetable Notes. Katie Campbell-Nelson, Genevieve Higgins, Lisa McKeag, Susan Scheufele, co-editors.*

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