
Bird Damage Prevention for Northern New England Fruit Growers

Introduction

Birds can become especially serious pests in blueberries and strawberries, but they also cause injury in other small fruit and tree fruit. Visiting flocking species such as starlings, cedar waxwings, grackles, and blackbirds cause some injury. Other problems come from pairs of resident birds that establish a territory on a farm, defend it from other birds of that species, and raise their families there.



Usually visiting birds are easier to scare away than ones that have established and defended a territory there. Flocks are frequently easier to scare off; the fright response of a few individuals, plus the desire to stay together may account for that.

There are many bird-control options, to fit a wide variety of problems. Some solutions (netting, for example) deter virtually all species, while others work only on a few. Birds quickly become accustomed to scare devices, so when you use them, change methods and/or location of scare devices frequently. When using scare devices, a combination of visual plus auditory methods works better than either alone. Keep them up only as long as you need them. It is much easier to prevent a feeding problem than to stop it once a strong pattern of activity develops.



Most birds are protected by the federal Migratory Bird Treaty Act or state laws, so this limits the options for dealing with them. It also helps to remember that many species of birds that eat our fruit also eat insects and may play a beneficial role on the farm.

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Bird netting

There's no question netting is the most effective way to prevent bird injury to many fruit crops. But this method also has the highest initial cost, especially the labor involved in setting up and removing netting. The cost can be spread over five to 15 years, depending on the quality of materials, and the care in assembly, disassembly, and storage.

Cost-sharing programs may help pay for netting a crop. For example, in New Hampshire, the Natural Resources Conservation Service (NRCS) can help pay for some netting or fencing projects.

Netting is less practical for short-term crops (strawberries, for example). It could be done on a small strawberry plot, using arches of plastic pipe to support the netting. Once a crop is netted, this usually limits your ability to apply pesticides, mow, and perform other operations with large equipment. Customers need to move easily from row to row underneath netting, so this may affect placement of posts and netting.

Highbush blueberries are the most commonly netted crop in northern New England. Support your netting on a network of posts and wires, rather than resting it directly on the plants. For highbush blueberries, that typically means placing netting seven or eight feet high, or even higher, as it tends to sag in some spots. Seven feet is easier for setup and removal, but then the netting sags to five-and-a-half feet in some spots. Higher posts mean a more difficult setup and removal, but the netting rarely sags as low as six feet.

If you have a large planting to cover, the logistics of setting up new netting each year can be difficult, but with experience, growers find it gets easier. Be sure to plan on incorporating entry/exit spots for customers and workers. Don't leave netting completely open on one side, for easy access to customers and equipment. That defeats the purpose; the birds quickly learn how to get in.

Highbush blueberry growers typically use 4" x 4" pressure-treated wood posts, although some use round cedar posts. Posts support well for many years if they can be firmly placed three or four feet into the soil. They can be set by augering holes, or by pounding. Pounding may make them less likely to shift over time, but rocky soil can make this method difficult. To give augered posts more stability, consider setting them in concrete.

Some growers cover the post tops with something smooth, so the netting won't easily catch on a corner or tear during setup, removal, or when the wind blows. Common solutions include rubber inner tubes or plastic bottles. For the interior, some growers use temporary posts: 2' x 3', sometimes alternated with strapping. Distances vary, but most growers set exterior posts every 25 to 50 feet.

Dark 12-gauge (2.5-millimeter diameter) nylon monofilament line is useful as the supporting network for wires. It's light, inexpensive, won't corrode, and lasts many years. Growers who have tried clear monofilament report that after a few years the initially smooth surface becomes slightly roughened. Smooth is preferable to allow easy setup, removal, or adjustment of netting.

Monofilament, often used in trellises for grapes and raspberries, probably carries a lower risk of lightning strike than metal wire. For one thing, if lightning does strike it, the filament tends to melt/vaporize quickly, rather than transmit much of the charge along the whole length. "Wirewise" fittings firmly hold the line, and easily allow tightening.

Formerly, netting was available in sections held together by “sewing” them at intervals of 10 feet or so with ¼-inch diameter 16-inch dowels. Painted dowels work especially well, since they stay smooth after years of use, and can be set in place in two or three seconds. Removal is even faster (if they are smooth).

Sharpening both ends in a pencil sharpener eases placement. If the sidewall netting is cut slightly longer than necessary, this facilitates using a length of pipe laid on the ground to hold it in place. The excess net is brought under the pipe and “sewn” back into place. Two advantages of this method are 1) the sides stay vertical (less interference with mowing), and 2) creating a temporary entrance spot is fast and easy.



Improved netting options have become available, making it much faster to set up and attach sections together. Smart Net Systems is an example of one that has reinforced edges designed to have support “wire” threaded through them, without breaking. Some types have support “wire” incorporated in the edges and side curtains specifically designed for that purpose. Some dealers (e.g., OESCO) will help growers figure out what netting products and dimensions will work best to fit a plot’s length, width and height most efficiently. C-clips are now available to rapidly attach sections together using the support wires at each edge of the piece.

Lightweight, extruded black-plastic (often polypropylene) bird netting usually comes in ¾-inch mesh size. The black plastic usually has a fairly long life outdoors, being minimally affected by sunlight, and not vulnerable to rot. Setting it up just before berries turn blue and removing it promptly at the end of the season extends its life. One grower who stores it in the field (bunched on top of the posts and wires) reports the field life is more than 10 years



so far. It typically costs three to five cents per square foot, and some growers report having it last 15 years or longer. Some recoup their costs by re-selling old pieces to backyard gardeners. **[Note: costs listed in this publication are based on 2009-10 figures.]**

Soft-knitted, black poly-olefin netting is also available. According to the manufacturer (J.A.Cissel), the product's life expectancy is five to 15 years. At one New Hampshire site, their 15-to18-year-old knitted netting is getting brittle and easy to rip. Cost is roughly eight or nine cents/square foot. This material is softer but seems to catch and tear more easily than the extruded black plastic.

Slightly heavier white netting, commonly used on grapes, is also available from some suppliers (e.g., Spec Trellising). It's heavier than the above examples and made of high-density polyethylene with UV resistance. The manufacturer gives a 10-year UV warranty.

When planning, don't forget to figure in netting for the sides. Posts, wire, anchors, doors and other supplies typically bring materials costs to between \$2,000 and \$3,500 per acre. Growers who use care in setup and disassembly can spread much of that cost over many years.

Field shape affects cost: A long, narrow planting has higher edge-to-area ratio than a square one, making it more expensive to net, because it requires more clips, anchors and other accessories to join, fasten, and mend. Many growers mend with twist ties, string, or dowels.

At the end of the season, some New Hampshire blueberry growers carefully roll up the netting onto the support wires and store it there, covered by black plastic. The following summer, spreading it out is very quick. At one such site, the netting has lasted more than 10 years.

Grape growers sometimes support the netting in their vineyards by a network of posts and overhead wires. Grape trellises are high enough so setting up this system takes a lot of labor. Some growers drape netting directly over the vines and fasten the sides together at the bottom. The vines and tendrils grow into the net, leading to difficult removal and tearing. One grower fastens netting that is about four feet high to each side of the trellis, applying connectors occasionally. The netting is joined at the bottom, keeping the fruit protected, but leaving foliage at the top uncovered. It seems to work well.



Cherries require a higher support system and equipment to set it up, which adds to the costs and difficulty of setup.

Visual scare devices

Visual devices include plastic owls, scare-eye balloons, scarecrows, flashing tape, mirrors, dead hanging crow, circling hawk kites, and others. Set out visual deterrents only when you need them, and promptly remove them when not needed. Placing them too early allows birds to become accustomed to them.

Effigies

Although sometimes called “decoys” (devices intended to attract wild animals), raptor models (usually owls) are intended to repel birds. If these effigies are realistic enough, they can work reasonably well for a short time. If placed in unnatural positions (tipping over, for example) they have little or no effect.

Moving an owl effigy to a new location once or twice a day can greatly increase its effectiveness. Don't put it out longer than needed. Some effigies incorporate movement, either by turning around, moving the head, or having wings that move. Realistic position and movement increases effectiveness. Rigid effigies cost between \$12 and \$16, moving ones \$20 to \$60.

One combination effigy developed by researcher Michael Conover proved very effective for deterring crows. It incorporated a crow model with flexible, extended wings that could move in a breeze. Conover placed a great horned owl model on top, as if it had killed the crow. The whole thing was mounted on a small platform that allowed it to freely swivel in the wind.

Scare-eye balloons

Available from suppliers, some scare-eye balloons seem to be somewhat effective, if they are placed on high poles (to make them visible). They are filled with air, not helium. Balloons seem to repel tested bird species for six to 20 yards, so it takes multiple balloons per acre. The smaller (18-inch) ones typically cost less than \$10 each; yellow is reported to be an effective color. The 24-inch yellow balloons with larger holographic eyes (left side of photo) are reportedly more effective than the smaller ones with simple eyes (right side) and cost \$45 to \$50 each. Effectiveness usually diminishes after 10 to 14 days.



Dead crow

Hung prominently, this effectively deters crows and ravens. Some growers shoot one or two crows during the hunting season and preserve them in a freezer, removing and displaying them as needed. One has even had success tying a bunch of crow feathers in a manner that resembles a dead crow, with outstretched wing. The dead-crow method may be distasteful to pick-your-own customers, if it's visible to them. It is still a useful option in other situations.

Reflective tape, pans, or mirrors

Usually considered visual devices, some reflective tape, pans or mirrors incorporate noise as well. Shiny mylar tape typically costs \$6 to \$7 for a 300-foot roll. Growers with pick-your-own operations report that kids often tear down tape. It also tangles in bushes, making a mess. Shiny aluminum pie pans are often hung from posts, intended to flash in the wind, plus make banging noises when they hit the stake or post. They're inexpensive. Growers also use shiny discarded CD's as well, but they don't make much noise. Growers usually rate them as having low effectiveness.

One device (Peaceful Pyramid) uses a pyramid of mirrors on a rotating platform powered by a car battery. Field reports suggest it's less effective in heavy vegetation (e.g., vineyards, cherry orchards, or blueberry plantings) than in open situations such as strawberry fields. That makes sense—thick vegetation hides the bright flashes.

Hawk-mimicking kites

In the late 1970s, UNH Cooperative Extension and USDA Wildlife Services staff tested hawk-mimicking kites suspended above blueberry and sweet corn fields by weather balloons. They worked fairly well, but logistics were sometimes difficult. In windy weather it was hard to get the system to work; it blew down low and tangled in vegetation.



When attached properly (horizontally), the 3-4-foot kite circled freely, just like a hunting hawk. Swivels just above and below the kite allowed it to turn endlessly without twisting the line. The balloons floated 100 feet or so above the kite and the kite 150 to 200 feet above the ground. It took several 3-foot-diameter round balloons, or one large blimp-shaped balloon to provide sufficient lift in a light breeze.

The balloons were tethered with 50-lb test monofilament fishing line (80-lb test when a larger meteorological balloon was used). This system isn't appropriate if power lines are close by. Also, balloons are vulnerable to vandals with guns. In their tests, repellence (this method tried alone) worked for two to 10 days.

Tests in California vineyards showed that one kite protected 5-6 acres of grapes. On very hot days, some balloons burst, especially if over-filled. The kites are readily available at hobby shops for about \$10. Balloons are the most expensive component, and helium is probably the next most expensive part. Balloons can't be easily/successfully stored for re-use.

A recent version of the kite idea is a wind-launched flapping hawk-shaped kite on a 20-foot pole. When the wind blows, the kite automatically launches on a short tether, and flaps. When the wind dies, a weight pulls it back onto its "perch," where it rests until the wind blows again. "The Eagle" costs more than \$200.

"Windmill"

A "windmill" incorporates motion and sound. The blades are three feet long and light, with ultraviolet-reflecting



paint. Sales literature suggests it resembles the flapping wings of a flock of birds taking off. The device typically sells for \$75 to \$90, mounted on a high post for visibility. It works well on large birds (geese, gulls, cormorants) and may work on smaller ones as well. Windmills have been recommended in New Hampshire as a deterrent for turkeys.

Human or human effigies

People actively working or picking in the field are a very effective deterrent. People are visible, they move, and make noise. There's even a "scaryman" to mimic this: a human effigy on a timer, that periodically inflates, then falls. One major problem is that few people are in the fields early in the morning, so birds easily move in and eat. Some species such as cedar waxwings are more tolerant of people and have a relatively short fright distance.

Auditory deterrents



Sound devices can be very effective, but most are objectionable to people. This limits their usefulness, as customers, neighbors and employees can find them annoying. Research has demonstrated that auditory devices work best when noise occurs at random intervals, a mix of sound types is used (rather than just one type), and other methods are used together with noise.

All bird species tested became habituated to nearly every sound tested. Adult birds are more easily scared off by sounds than juvenile birds, like the young robin in the photo (young robins have spotted breasts; adults have red-brown breasts).

Automatic propane cannons

Automatic propane cannons can be effective, especially if there isn't much vegetation to muffle or block the sound. Be sure there isn't dry vegetation close by (fire hazard). Cannons are controlled by a timer and can be left unattended.

Growers planning on investing in such equipment should check local ordinances before they buy, and let the police know of their plans. Some years ago, a police SWAT team was called in because "someone was shooting." Cannons have been the subject of bitter farmer/neighbor problems, and occasionally they get vandalized. One model (Zon Mark 4) offers variable volume, variable direction, and a variable time interval between detonations. Others feature a remote control, so growers can fire when they see a problem developing. Depending on features, an automated propane cannon costs between \$350 to \$750, more for one with a remote control.



Firecrackers

Firecrackers can be attached to 5/16- or 3/8-inch cotton rope. At varying intervals, insert the fuse of a firecracker into the rope. Suspend it over a shallow pan of water (fire prevention), two to 10 feet off the ground. Then light the rope, and let it slowly smolder. Disadvantages: this takes time and skill to set up correctly, and only works in dry weather. Check local and state regulations before using firecrackers. Regulations are subject to change; it may not be legal in your state or town.

Pyrotechnic devices

These work best on flocking species. Some devices come with special pistols (“launchers”) to fire them; others are fired (from the hip) from a 12-gauge shotgun with an open choke. They scare for a short time, and then birds return. They can be expensive, as much as \$2 or more per shot. Upon being fired, “bangers” travel 100 yards or so, then explode, while “screamers” emit a high-pitched whine as soon as they leave the gun or launcher. Some use pyrodex or black powder as the propellant, which are corrosive to the gun barrels. This requires flushing the gun barrel with hot water, wiping it dry, then oiling it after each day’s use. One supplier (Stoneco) is now using smokeless powder in 12-gauge shellcrackers [bangers]. These also require cleaning the barrel, but not the hot-water bath associated with black powder. When using any pyrotechnic device, follow all the manufacturer’s precautions, including eye and ear protection.



Some communities regulate the use of pyrotechnic devices and propane cannons. Before making a significant investment, check on local laws. People purchasing bird-control pyrotechnics need to fill out a wildlife control statement, a federal Alcohol, Tobacco and Firearms form modified for agricultural users. The form is often accessible through the vendor’s website.

Electronic distress calls

Devices that mimic the calls of birds in distress can be very effective. Some devices can be programmed to play several different species of distress calls. This variability improves their effectiveness, both by delaying how long birds get accustomed to them and by widening the number of bird species they will deter. Some models have multiple speakers connected with long wires and that randomly rotate the calls to come from different speakers. Many are powered by a car battery, although some feature a solar panel to recharge the system in daylight. These systems cost between \$200 and \$3,000, depending on the features.

To a degree, any bird-distress call will deter a number of species, but species-specific calls can be highly effective. In blueberries, these commonly work for about a week, then their effectiveness declines. At that point, adding other devices and changing the calls or pattern will help keep it effective longer.

“Critter Gitter”

This device uses motion and heat detectors that trigger an alarm to surprise whatever passes by. It can vary the alarm signal to reduce the chances of wildlife getting used to it. It wouldn’t be effective for flying birds, but it might be helpful for large birds (e.g., turkeys) that walk into your planting along a likely route. It runs on a 9-volt battery. The detector has about a 90-degree angle of sensitivity, out to almost 40 feet. It isn’t

weatherproof, but could be deployed in a plastic bag to keep out rain. The bag would probably reduce the sensors' ability somewhat. Amtek (see list of suppliers) produces it, but it is also sold through distributors such as betterbee.com (about \$50; see website).

“Scare-away bird line”

This is a thick, bluish green plastic or nylon line strung taut horizontally between round stakes or poles, preferably at right angles to the prevailing wind, about 15 feet apart. It has no shiny surface, but is intended to vibrate in the wind. Obviously, when there is no wind, it doesn't make noise. The material costs about \$7 for 100 feet. In a 1986 Rhode Island study, it performed poorly in protecting blueberries. The researcher noted that birds often used it as a perch. One New Hampshire highbush-blueberry grower did get excellent results on crows using this technique.

Electric perching wire

One device from Australia, but not yet commonly employed in U.S. agriculture, is setting up two electrified wires, separated every few feet by special insulating spacers, which keeps the ground and hot wires from touching each other. The wires are set above the bushes or trellis, offering handy perches for birds, and hooked up to an electric fence charger. When a bird lands, its feet touch both wires and it gets an electric shock. Setup requires some labor. It may be useful in a situation where an electric fence already exists, perches are limited, and species that like perches (e.g., cedar waxwings) are targeted. I can find no published research on applying this concept (Insulbird) to agriculture.

Taste repellents

Taste repellents may be appropriate for some crops but not for others. They are washed off by rain, so may need multiple applications. It's unlikely that wine makers would want to apply taste repellents on their fruit as it might affect the taste of the wine.

At least two products on the market for use on fruit contain the taste repellent methyl anthranilate as the active ingredient. Methyl anthranilate is manufactured for the food industry as a grape-flavor additive, and it is on the Food & Drug Administration's Generally Regarded as Safe (GRAS) list. It's very similar to a natural compound in Concord grapes.

The material is quite volatile, so two to three days or so after spraying, the effectiveness goes down. Rejex-it** and Fruit Shield** are the trade names. Rejex-it is federally registered for cherries, blueberries and grapes. The label lists particular target species, including robins, starlings and cedar waxwings. The spray can be applied up to the day of harvest. Spraying wet fruit or if rain is expected is not allowed.

Fruit Shield is registered for stone fruit, apples, table grapes and berries (as well as other non-fruit crops). Harvest is a minimum of five days after treatment, and spraying wet surfaces is not allowed. It appears that the best repellency comes from applying it as coarse droplets, not a fine spray. Some growers may not want to present a strong artificial-grape smell/flavor to customers.

Both Rejex-it and Fruit Shield were registered in New Hampshire, Maine, and Vermont in 2009. As this publication went to press, registrations were incomplete for 2010. You may wish to check with your lead agency on registration in your state. *Organic growers who choose this option should check with state pesticide regulators or their certifying agent about taste repellents acceptable for use in certified organic operations.*

Research on methyl anthranilate on blueberries was replicated in Washington, Michigan, and Oregon in 1995. They applied six gallons of product (the ag-36 formulation) per acre, and it wasn't very effective. Their seven-day spray interval probably was too long.

Other research on methyl anthranilate demonstrated phytotoxicity (burning foliage) as a problem on some plants, so following label precautions is important. You might want to look at the label details before buying the material. Rejex-it is from Ceannard, Inc. and Fruit Shield is from Bird-X Inc. Their contact information is in the list of suppliers at the end of this publication.

Some New England growers have sprayed an anti-cracking material (Vapor Gard) on cherries and have reported a reduction in bird problems. Although I've placed this product in the taste repellent section, we really don't know the mechanism that accounts for the reported effect. I've seen no published data. The U.S. Environmental Protection Agency does not regulate this as a pesticide, so you won't find it on a pesticide registration list.

There is some research on spraying sugar (sucrose) on blueberries to reduce bird feeding. Some birds can't digest sucrose (a disaccharide) and have been shown to develop an aversion to high-sucrose fruits. The predominant sugars in many fruits are mono-saccharides, not sucrose.

This method is worrisome, because many flies, wasps, and hornets readily feed on sugary things. Ants occasionally become a nuisance in blueberry plantings (especially those using wood chip/bark mulch), and spraying sugars would increase their numbers. Sooty mold (black stuff on leaves and twigs) grows on sugary residues. In the experiment (done on blueberry plantings), Japanese beetle and yellow jacket numbers rose in the sucrose-sprayed plots the second year. Rain washes sucrose off the fruit.

There are taste repellents for other vertebrate pest problems. Thiram** (a fungicide), putrescent egg solids, and capsaicin are examples of some used to repel mammals. To date, none but methyl anthranilate has been labeled to protect fruit.

Toxicants

Toxicants have been used for bird problems in agriculture in some limited situations. Typically, these require specially licensed, trained personnel, and involve non-crop situations such as serious bird problems around buildings or feedlots. In some cases the poison is incorporated in bait; in others it's applied to perches. *No toxicants are legal for protecting crops in New Hampshire, Vermont, or Maine.*

Shooting

Shooting might be approved in a few limited situations in New Hampshire, but in general, it isn't recommended for handling bird/fruit problems. For one thing, the fine lead shot (it's toxic) could lodge in fruit. (Migratory Bird permits require the use of non-toxic shot.) Also, the shot could damage plants significantly. International treaties cover some species (crows for example), and federal and state laws also apply.

In New Hampshire, state laws allow commercial growers experiencing "actual and substantial" damage from wildlife to defend their crops by shooting wildlife in the act of damaging. The allowed conditions are very specific:

RSA 207:26 Killing by Land Owner of Bird or Animal Inflicting Damage. A person may pursue, wound or kill, on land owned or occupied by such person, any **unprotected bird or wild animal** which the person finds in the act of doing actual and substantial damage to poultry, crops, domestic animals, or the person's property, and may authorize a family member, employee, or other person requested to do so under the provision of a depredation permit issued by the executive director [Fish & Game Department] pursuant to RSA 207:22c, III

Most birds that damage New Hampshire crops are migratory (protected) species, so shooting isn't an option. Migratory species doesn't include turkey, ruffed grouse, and crow. In New Hampshire, permits for shooting game birds, crows, and blackbirds are issued through the USDA Wildlife Services office in Concord (603-223-6832) on a case-by-case basis.

There's also a hunting season on crows, which may provide recreational opportunities and damage relief (see under the section below, "Notes on Certain Species"). Unprotected species include starlings, English sparrows (house sparrows) and pigeons (rock doves).

In Maine, permits for shooting migratory birds can be issued through the USDA Wildlife Services office in Augusta (207-622-8263). To shoot game birds, contact local Maine game wardens.

In Vermont, pigeons are the only birds not protected. Vermont authorities point out that federal law (Title 50, 21.43) states in part "A Federal permit shall not be required to control yellow-headed, red-winged, rusty, and Brewer's blackbirds, cowbirds, all grackles, crows, and magpies, when found committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance."

When growers use shooting, usually it isn't necessary to kill a lot of birds. The experience of being shot at (human movement, surprise, noise) is a significant deterrent that birds remember. Most species of birds learn quickly and change their behavior, especially crows.

Trapping

Trapping may be an option in some situations, for example, English sparrows, starlings, blackbirds or pigeons eating a lot of animal feed. But trapping birds that attack fruit rarely makes sense.

Nearly all of New Hampshire's bothersome species are migratory. Permits from the U.S. Fish & Wildlife Service are required for any trapping of migratory birds. The telephone number for New Hampshire is 603-223-6832 and in Maine, 207-622-8263. Traps are usually designed with particular species in mind. Flocking/gregarious species are better targets for trapping than non-flocking birds.

Vermont fish and wildlife laws included under Title 10: 4904:

Use of light, snares, traps: A person shall not take a bird with the aid of a jack or other light. A person shall not take a wild bird by trapping, netting or snaring, or possess such a bird so taken, or set, place or use, where birds may be taken, a net, trap or snare for taking birds. Such a net, trap or snare is hereby declared to be a public nuisance and may be summarily abated and destroyed by any person, and game wardens shall seize and destroy such devices. The commissioner, however, may authorize the taking of birds by nets or traps or other devices, under such regulations as he may prescribe. (Added 1961, No. 119, § 1, eff. May 9, 1961.)

Nest boxes for hawks and owls

A UNH Cooperative Extension fact sheet provides instructions on erecting nest boxes to encourage raptors, how and where to place them, and plans and dimensions. Here's the URL <http://extension.unh.edu/Agric/AGPMP/Pubs/Apft5902.pdf>

If hawks live on a farm, fruit-eating birds may be less likely to feed or live there. There is no data for northern New England, but research in other parts of the country clearly demonstrated it helps in some situations. Setting out prominent perches could help as well, if they are lacking.

These methods probably won't help in berry fields. Most hawks or owls aren't going to sit close by while people are active in the area. The sparrow hawk (kestrel) is a local species offering the greatest promise for using this method. Sparrow hawks like open areas and readily accept houses of the correct size, *when they are appropriately placed*. Clean the boxes annually to keep attracting the hawks. Several growers interviewed for this publication said that bird problems plummeted when a pair of sparrow hawks (or red-tailed hawks) took up residence on their farms. Sharp-shinned hawk and Cooper's hawk specialize in attacking birds in our region, but they don't readily use nest boxes or nest platforms.

Falconry

Falconry offers potential for bird control, but with so few licensed falconers in northern New England, it's not realistic at this time. Falconers need to regularly exercise and train their birds. A live raptor flying on a farm is very effective at moving birds away. If transporting hawks and falcons were feasible, fruit growers would eagerly invite falconers to fly their birds at the farm during the period that birds attack their fruit. This could be any time from late June through early October, depending on what crops are grown.

Falconry is carefully regulated in New Hampshire, Vermont, and Maine, and state authorities can direct you to those regulations if you're interested. Since this option is unlikely to work for the vast majority of growers we haven't listed those regulations here.

Reducing habitat favorability

In some situations, growers can make their farms less attractive to pest species. One example is with cedar waxwings. They very strongly prefer berries as food, so places that have lots of red cedar, shadbush, glossy buckthorn, crabapple, mulberry, and wild cherries offer highly attractive waxwing habitat. Eliminating stands of such berry-bearing species can reduce future problems with cedar waxwings. Bird attacks may vary with the amount or condition of wild food available that year. Numerous observers have noted that bird attacks on apple and sweet corn are heavier in dry years than wet years.

Cedar waxwings also like nearby perches (trees, wires, etc.) when they are feeding. Fields far removed from perches suffer fewer attacks. Redwinged blackbirds prefer to live in wetlands. Starlings, blackbirds and grackles are frequently attracted to cornfields, especially in late summer, when ears are developing. Planting small fruit plantings away from such spots may reduce the risk of problems from these species.

Specific bird problems

Eating fruit buds on tree fruit

Ruffed grouse and evening grosbeaks sometimes seriously de-bud apples. Injury usually occurs from December through March. Grouse injury is usually heaviest in trees close to woodland. Evening grosbeak injury is usually associated with a nearby bird feeder.

Pecking holes in fruit

There are few options to reduce the problem. Pecking is worse in dry years than in rainy years. Apples, peaches, and pears are common targets, and the problem is sporadic. Corvids (blue jays, crows, ravens) are frequent culprits. In apples, Cortland, Paulared and Honeycrisp are the varieties most frequently reported injured.

Breaking branches

Crows or ravens landing on young fruit trees (sometimes to eat soap bars placed as deer repellent) can break the tender new branches when they land. If you hang soap bars to deter deer from feeding on very young trees, consider hanging them from four-foot stakes rather than on the trees.

Droppings on fruit

To keep birds from roosting on rafters and contaminating fruit or other things stored below, apply bird netting to the rafter area. Black netting is inexpensive and minimally visible/objectionable to people. Sticky substances (such as bird tanglefoot) can be smeared on rafters, but these are messy and need periodic renewal. Spiky metal or plastic strips can be nailed to perches, an effective strategy, but metal spikes could be dangerous to anyone who has to go into the rafters to work. Shock strips placed on the rafters give a mild electric shock when birds step on them and deter roosting.

The incidence of droppings on fruit in the orchard is low. Washing fruit may be an option.

Nesting in the field

Depending on the situation, this may or may not be a problem. Killdeer regularly nest in strawberry fields and often are still sitting on eggs when harvest time arrives. This means they defend the nest from intruders. Some growers find this an interesting bit of natural history to point out to customers, but plants close to the nest might not get picked, and the birds might deter some customers worried about the situation.

Bird problems in highbush blueberries

Problems may begin when the first fruit begins to turn blue and continue until no berries are left. Robins, blue jays, cedar waxwings, starlings, grackles and catbirds are often the culprits. In addition to consuming fruit, they knock ripe fruit off the bush. Wild turkeys, northern orioles, scarlet tanagers, redwinged blackbirds and thrushes may also consume ripe fruits. Wild turkeys often eat fruit knocked to the ground, including green berries and mummy berries.

Bird problems in cherries

Cedar waxwings, starlings, crows, and blackbirds are the most frequently reported pest species in northern New England cherries. Problems begin when the fruit starts to turn color. Growers report that the anti-cracking material *Vapor Gard* reduces bird problems. The most reliable way of reducing bird damage on this high-value crop is with netting. Most growers support netting on a series of posts, with a wire (could be poly) running down the center of each row. Picking platforms can be helpful to set up and remove netting.

Bird problems in raspberries

Most growers report few bird problems on raspberries. Resident pairs seem to cause more problems than visiting flocks. Growers report seeing robins and grackles. Several growers reported birds nesting in their raspberry plants. Growers of thornless blackberries sometimes report bird feeding and nesting.

Bird problems in strawberries

Problems begin when some fruits begin to show red. The low-growing, open habitat of a strawberry field probably affects which species are pests. Cedar waxwings and turkeys are the most common pests. Cedar waxwings will continue to feed even when pickers are only a few rows away. Turkeys flock in winter, and often scratch protective straw away from strawberry plants in winter and early spring. Unprotected crowns survive the winter poorly, and labor is required to add mulch that removed by birds. Crusted snow stops this activity.

Bird problems in grapes

Birds begin to attack grapes soon after veraison (onset of ripening), so northern New England growers have a vulnerable period of about six weeks. Birds attack dark-colored varieties more than green varieties. Problems are especially acute when seeds have matured and fruit acidity goes down. Robins, starlings, flickers and crows are common pests, while orioles and mockingbirds are sometimes reported. It may help to plant the bird-vulnerable varieties towards the vineyard center, and the less-preferred varieties towards the periphery (or wherever bird problems might be worse).

Pecking ears of sweet corn

Sweet corn varieties vary in the degree that the husks cover the tips of the ears. Varieties with good tip coverage are much less prone to pecking injury, compared to those with some kernels visible. This trait is frequently measured and reported by plant breeders and extension staff who screen varieties. Among those varieties with poor tip coverage reported: Ecstasy, Seneca Arrowhead, Seneca Tomahawk, Everprime, Fantasy, SEB 6803, and Sensor. Varieties with reported good tip coverage include: Sweet Chorus, Sweet Symphony, Mystique, Trinity, Double Gem, War Dance, Jumpstart, Twilight, Serendipity, and Fantasia.

Some ears are attached to the stalk at a greater angle than others, sticking out and presenting a more inviting perch. These seem to suffer more bird pecking than varieties with ears more upright. This measurement is less commonly reported in variety trials, so data is harder to find.

Some growers have experimented with “topping” sweet corn—cutting off the top of the corn plant just above the top of the ears after pollination is complete. The cost of topping is offset by the reported benefits: two or three days’ earlier harvest, easier picking, reduced bird damage, and reduced wind lodging. Chuck Bornt and Ted Blomgren (Cornell Cooperative Extension) reported 1.4 to 10 times as many bird-pecked ears in untopped corn, compared to topped plants in the same trials (2004).

Crows, grackles, blackbirds and starlings are the most common species reported doing this kind of injury, and noise devices work fairly well to resolve problems.

Pulling out sprouting corn

Crows, blackbirds, starlings and grackles are the most commonly reported species that pull out sprouting corn. In addition to a prominently hung dead crow, one method that has worked fairly well is to plant corn into stubble or cover crop, rather than plant into a smooth, even, debris-free seedbed. The idea is that the sprouting corn is less visible when it is most vulnerable.

Notes on certain species

Blue jays are blue, with black and white markings, a white-tipped tail, and a crest on the head. Jays are often observed pecking peaches and apples. Injury is worst in dry years. Some growers remove pecked fruit, thinking it attracts them. Leave pecked fruit alone, because if you remove the injured fruit, the only fruit left to peck are good fruit. Blue jay is our second most commonly reported blueberry feeder, after robin. Gray jay occurs in northern and mountain regions of Vermont, New Hampshire and Maine, but doesn't seem to be a fruit pest in Northern New England.

Cedar waxwings are usually found in flocks, even during breeding season. They are small birds (the size of a large sparrow) and their crests and yellow-tipped tails make them easy to identify. They have a thin, one note call. They strongly prefer berries for food, so they prefer to live where there are lots of cedars, crab apples, shadbush, glossy buckthorn, honeysuckle, chokecherry and other berry-producing trees and shrubs. They have a relatively short fright distance, so they readily feed just a couple of rows away from people. Strawberry patches with nearby trees (to perch) are sites with higher risk from cedar waxwings. Erecting a kestrel (sparrow hawk) house was very successful for one New Hampshire grower. These are small birds, easily urged elsewhere by kestrels.



Crows and ravens are highly intelligent birds in the family *Corvidae*. Northern New England has three species of corvids that look very similar: American crow, fish crow, and raven. All are large, black species. Ravens have more wedge-shaped tails than crows, and heavier bills. They also spend more time soaring than crows. They have a coarse, croaking call. All corvids are protected by state and federal laws, including international treaties. This limits the use of lethal controls on them.

A hanging dead crow is very effective at scaring these birds away for several weeks. Some growers report success with large tufts of crow feathers, large enough to look similar to a dead crow. The legal hunting season for crows varies a bit from year to year, so *check state regulations before shooting*. In New Hampshire the 2009-10 season ran from August 15 through November 30, 2009 and March 16-31, 2010. In Maine it was August 1 to September 30, and the early 2010 season (February, March, April) varied by wildlife management district. In Vermont, the season ran from March 14 to April 30, 2010 and August 16 to October 29, 2010. Some growers shoot a crow during the season, place it in a sealed bag in a freezer, then bring it out to hang when needed.

Flickers and other woodpeckers occasionally attack cherries. They all have a characteristic pose perched upright on a tree trunk, braced by their tail.

Northern mockingbirds are sometimes reported attacking blueberries. The gray bird is about the size of a robin, and it has white wing patches that become visible when it flies. Males and females look alike.

Northern orioles (Baltimore orioles) are commonly reported from blueberry plantings. Males are easily recognized, bright orange and black. Females are olive-brown with a slight burnt-orange belly, and two thin white wing bands.



Evening Grosbeaks are plump birds, slightly larger than robins, with very heavy beaks, thus the name. Males look gray and yellow with patches of white and black. Females have less yellow. Both sexes have short, heavy bills. They are flocking birds that usually appear in winter, especially around bird feeders. They eat fruit buds, so avoid placing bird feeders close to your orchard.

Rose-breasted grosbeaks have the same heavy bill as evening grosbeaks. Males are black and white, with white wing patches that show when they fly.

They have a bright red patch on the breast. Females lack the red patch, and are more subdued in color pattern.

Redwinged blackbirds are most likely a problem near marshes or ponds, or if there are large corn fields nearby. The males have obvious red patches on their wings, while females look brownish. They tend to occur in flocks.

Grackles are black birds with shiny iridescence, yellow eyes, and long-ish tails. They are often found in flocks, sometimes mixed with black-birds or starlings. They are slightly larger than robins. Their size, voice, and long tails should easily distinguish them from crows. Grackles are omnivores, feeding on grains, berries, insects, and other foods.



Scarlet tanagers are regularly seen eating blueberries. They are slightly smaller than robins. Males are bright red with black wings. Females are dull green-brown on the back, and slightly yellowish below. They are most common in plantings adjacent to woodland.

Robins are among the most common and recognizable birds. Both males and females have dark gray wings, back and tail, and a red-brown breast. Young robins look very much like their parents, except they have black spots scattered on their breasts.

Starlings are black birds that tend to stay in flocks. Very small white spots are scattered on the breast, neck and back, but usually visible only with binoculars. They are smaller than robins, and have short tails. They eat insects, grain, seeds and fruit. They eat blueberries and cherries when available. Starlings (a flocking species) are easier to scare than robins.

Ruffed grouse are mottled brown, similar in size to a small chicken, but with a broad tail. They tend to be around the edges of woods. Among other foods, they eat apple flower buds, especially from December through March. Trees close to the orchard perimeter are usually the most heavily attacked. Grouse frequently flush explosively, surprising observers.

Wild turkeys primarily enter and feed on the ground, but occasionally they have been reported flying into fruit trees and pecking fruit. They usually gather in groups, so damage can be significant if they find fruit they like. They readily eat blueberries. A heavy bird landing on a tree or bush of ripe fruit can quickly dislodge a lot. These are game birds, with strict regulations on shooting.

List of Suppliers*

These companies sell products used to control birds. The list constantly changes, which means websites or phone numbers may have changed since publication.

The numbers following the specific materials refer to the supplier numbers below.

Anti-perching materials: 5, 11, 17

Auditory devices: 3, 4, 6, 7, 9, 11, 12, 18, 19, 20, 23, 25, 28, 29

Balloons: 1, 12, 18, 25, 29

Dowels: 13, 21

Raptor nest boxes: 29

Netting and associated supplies: 2, 5, 6, 7, 9, 11, 12, 14, 17, 18, 22, 23, 25, 26, 27, 29

Pyrotechnics: 12, 19, 20, 24, 25, 29

Taste repellents: 6, 7, 8, 9, 10, 11, 12, 19, 20,

Visual scare devices: 6, 7, 9, 11, 12, 15, 17, 18, 19, 20, 23, 25, 29

1. **Aerostar International.** 1814 "F" Ave. Sioux Falls, SD, 57104. Phone: 605-331-3500. Fax: 605-331-3520. E-mail: sales@aerostar.com. (Tetroons and other inflatable balloons to lift kites)
2. **Amberg's Inc.** 3164 Whitney Road, Stanley, NY, 14561. Phone: 585-526-5405. (Monofilament "wire" and fasteners to support netting)
3. **Amtek.** Phone: 800-762-7618. Fax: 800-762-7613. www.amtekipet.com. (Critter Gitter)
4. **Betterbee.** 8 Meader Road, Greenwich, NY, 12834. Phone: 800-632-3379. www.betterbee.com. (Critter Gitter).
5. **Bird-B-Gone, Inc.** Mission Viejo, CA. Phone: 800-392-6915. www.birdbgone.com/birdnet2000.htm. (Mostly products for structural bird control, but netting is included)
6. **Birdbusters.** 707 South Gulfstream Avenue #405, Sarasota, Florida, 34236. Phone: 866-915-8225 or 703-299-8855. Fax: 703-299-0844. www.birdbusters.com. (Netting, audio, visual and taste repellents)
7. **BirdGuard.** Bird Control Products 100 State Street, Erie, PA, 16507. Phone: 800-455-5167. www.birdguard.com. (flash tape, sound devices, netting, taste repellent)
8. **Bird Shield Repellent Corp.** P.O. Box 141556 Spokane, WA, 99214-1556. Phone: 866-272-2473. www.birdshield.com. (Info, MSDS sheets, labels for bird shield)

9. **Bird-X Inc.** 300 North Elizabeth St. Chicago, IL, 60607. Phone: 800-662-5021. www.bird-x.com.
(netting, visual and auditory devices, taste repellents)
10. **Ceannard, Inc.** 4110 136th St., Gig Harbor, WA, 98332. Phone: 253-853-7369. (technical information on rejeX-it bird repellent)
11. **Fly-Bye Bird Control Products.** 13609 NE 126th PL #150, Kirkland, WA, 98034. Phone: 425-820-8496 or tollfree: 800-820-1980. Fax: 425-823-8170. www.flybye.com. (Netting and netting supplies, auditory, visual and taste repellents, shock strips)
12. **Gempler's.** P.O. Box 44993, Madison, WI, 53744-4993. Phone: 800-382-8473. www.gemplers.com
(Visual and auditory devices, pyrotechnics, taste repellent, netting)
13. **H.A. Stiles Co.** P.O. Box 779, Westbrook, ME, 04098. Phone: 800-447-8537. Fax: 207- 854-3863. www.hastiles.com (wood dowels to join netting)
14. **J.A. Cissel Company.** Phone: 800-631-2234. (bird netting)
15. **JWB Marketing LLC.** 2308 Raven Trail, West Columbia, SC, 29169. Phone: 800-555-9634. www.scarewindmill.com. (Bird scaring windmill)
16. **Miller Chemical & Fertilizer Corporation.** P.O. Box 333, 120 Radio Rd, Hanover, PA, 17331. Phone: (717)-632-8921. (Vapor Gard anti-cracking spray)
17. **Nixalite of America Inc.** 1025 16th Ave., East Moline, IL, 61244. Phone: 888-624-1189. Fax: 888-624-1196. www.nixalite.com (mostly products for structural bird control, but netting, scareeyes, others are included)
18. **Orchard Equipment Supply Company, Inc (OESCO).** P.O. Box 540, Route 116, Conway, MA, 01341. Phone: 413-369-4335 or toll free: 800-634-5557. Fax: 413-369-4431. www.oescoinc.com.
(repellents, netting, trellis supplies)
19. **Orchard Valley Supply, Inc.** 1521 Mountain View Drive, Quakertown, PA, 18951. Phone: 888-755-0098. (Netting, line, fasteners, bird scare devices, etc.)
20. **Reed-Joseph International.** Box 894, Greenville, MS, 38702. Phone: 800-647-5554. www.reedjoseph.com (Visual and noise devices, pyrotechnics, lasers, taste repellents)
21. **Saunders Brothers.** 170 Forest Street, Westbrook, ME, 04092. Phone: 207-854-2551 or toll-free: 800-343-0675. Fax: 207-856-1295. www.saundersbros.com (Wood dowels to join netting)
22. **Smart Net Systems.** Doug Dickson 530 Kinnikinik Way, Comox, B.C. Canada, V9M-3V8. Phone: 866-890-0841. Fax: 250-339-3397. www.smart-net-systems.com (Agricultural netting)
23. **Spec Trellissing.** Phone: 800-237-4594. www.spectrellissing.com. (wire, clips, tools, netting, auditory devices, "bird scarer")
24. **Stoneco, Inc.** P.O. Box 765 Trinidad, CO, 81082. Phone: 719-846-2853. www.originalshellcracker.com.
(pyrotechnic devices)
25. **Sutton Agricultural Enterprises, Inc.** 746 Vertin Ave., Salinas, CA, 93901. Phone: 866-280-6229. www.suttonag.com (Flash tape, owl effigies, hawk kites, scare-eye balloons, distress callers, propane cannons, netting, trellis post caps, pyrotechnics)
26. **Tenax Corp.** 4800 E. Monument St., Baltimore, MD, 21205. Phone: 800-356-8495. (netting)
27. **U.S. Netting.** 100 State Street, Dept. 312, Erie, PA, 16507. Phone: 800-331-2973. Fax: 814-455-9336. E-mail: NTGproducts@yahoo.com (Netting, wire, fasteners)
28. **Vesey's.** York, PEI, Canada. Phone: 800-363-7333. Fax: 800-686-0329. www.veseys.com/us/en/store/tools/homegardentools/scareawaybird ("Scareaway Bird Line")
29. **Wildlife Control Technology, Inc.** 2501 N. Sunnyside Avenue, Fresno, CA, 93727. Phone: 800-235-0262. www.wildlife-control.com/agriculture.html (Visual and auditory devices, netting, pyrotechnics, owl nest boxes)

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****Stop!** Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. All pesticides listed in this publication are contingent upon continued registration. Contact the pesticide safety officials in your state to check registration status. Dispose of empty containers safely, according to state regulations.

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