Bird Control on Grape and Tender Fruit Farms

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Introduction

Bird damage to grapes and tender fruit (mainly sweet cherries and cultivated blueberries) is a serious problem for many growers. Unchecked, birds can completely destroy an entire crop. A flock of 5,000 starlings can consume up to 1 ton of food over a 10 day

period, and blackbirds were blamed for an estimated loss of 15 million tons of food worldwide in 1968. This is enough to feed 90 million people. Even with the best effort and control equipment, bird damage will still occur. In many cases, the cost of even limited success has been unacceptable due to social disturbance (noise from control equipment) and/or environmental impact (chemical controls). It appears as though bird predation is escalating, especially in the Niagara Peninsula where 95% of Ontario's grapes and sweet cherries are grown.

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Why Are Problems Worse Than Before?

Bird damage is increasing because there is a better tasting dinner available to them than before, and there is more of it. That is, sweeter grape varieties are being planted and the total acreage is increasing. Early season sweet cherry varieties are being planted to take advantage of early market prices, and hungry birds find them quickly. In the past, vineyards, fields and orchards were smaller and intermixed with other crops, but today, they are much larger. Large flocks of birds can all feast together without having to constantly forage. Finally, bird populations are increasing, and there have been changes to migration patterns due to climatic changes.

Bird Species

Table 1 lists the main birds that cause damage to grapes, sweet cherries, and blueberries. While many people are aware that scavengers such as grackles, gulls and starlings are a nuisance, few think of the beautiful robin, oriole, or mockingbird as a problem for grape and tender fruit growers. However, it is important to know which birds give problems. Figure 1 shows some of these bird pests for easier identification.

Table 1. Some Birds That Cause Problems in Fruit Crops

Fruit Crop	Crop Season	Birds (in order of importance)
Sweet cherries	Early	robin, starling, grackle, gull
Sweet cherries	Late	blackbird, grackle, starling, robin, goldfinch, oriole, gull
Blueberries		robin, starling, finch, oriole, cedar waxwing
Grapes	Early	robin, starling, oriole
Grapes	Late	robin, starling, mockingbird, finch

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Bird Behaviour

It is important to know how birds behave in order to control them. Here are some facts to help understand bird behaviour:

- Large flocks of birds are easier to scare than small ones.
- Starlings will fly 25 km from a roosting site to feed, flying at up to 70 km/hr in short bursts.
- Bird damage patterns can vary considerably from year to year and from farm to farm.
- Bird damage is usually localized and not uniformly distributed throughout an area.
- Birds are opportunists, feeding on whatever is available.
- It is difficult to break birds of the habit of feeding in a particular area once they are established.
- Birds establish their home territory in late April and May and often remain in the area until the crop ripens.
- Crops near roosting or nesting areas, woodlots or ponds are more vulnerable than those in the open.
- Birds acclimate quickly to uniform movements or noise patterns.
- Different species of birds respond differently to various repellent methods.
- Birds can be diverted to other nearby feeding areas.
- Birds will endure significant hardship to feed.
- Birds often follow the same flight patterns to feed.
- Birds usually feed early in the morning around sunrise and late in the afternoon around sunset.
- Birds like to drink water when they feed.
- Some birds travel in migratory flocks, while others fly in from local woods.
- Birds feeding on your crop will attract other birds, compounding the problem.
- The sweeter and earlier the grape or cherry variety, the more attractive it is to the birds.
- Even if crops are protected with netting, birds may perch on the nets and feed through them or find small holes.

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The following are common birds that cause economic damage feeding on Ontario grapes and tender fruit (reprinted from *Eastern Birds: An Audubon Handbook, (1988), Farrand Jr., J. with permission from The McGraw-Hill Companies)*:

European Starling

American Robin

Northern Mockingbird

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Northern Oriole

Common Grackle

Figure 1. Pictures of some of the most common bird pests- European Starling, American Robin, Northern Mockingbird, Northern Oriole and the Common Grackle.

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Bird Repellent Methods

There are four types of bird repellent methods currently available to growers:

- acoustical repellents
- visual repellents
- physical exclusion
- biochemical repellents

An integrated approach, using a variety of these repellent methods is needed.

Acoustical Repellents

Acoustical repellents rely on sound to scare birds away. Birds have a hearing range similar to humans, so if people can hear it, birds can hear it. Unlike rodents, birds *cannot* hear ultrasonic sounds.

1. Propane-Fired Cannons (Bird-Bangers)

The most familiar acoustical bird repellent equipment is the propane-fired cannon (Figure 2). These units cause birds to flee by producing loud, unexpected blasts. Also known as bird-bangers, these are available in a wide range of configurations, from mechanical single-shot units, to fully electronic, randomized, rotating multi-shot units. These latter units are the most effective over the long term, since the timing and direction of the blast is truly random and the birds do not know when or where the next blast will occur. Although the loudness of the blast is important, it is the unexpected nature of the blast that keeps birds nervous. Units should never blast at intervals of less than 3 minutes. Birds quickly get accustomed to units that are stationary, shoot at regular intervals, or fire very rapidly. More blasts are not better.

Unfortunately, neighbours never get used to propane-fired cannons because of the loud sounds produced (measurements taken beside the units have shown up to 115 dBA), the frequency of the blasts (up to 20 times/hour), and the time of day they must operate (starting at dawn when people are still sleeping). Many people work shifts and must sleep during the day, so propane-fired cannons are not very popular with them.

The newer fully electronic propane-fired cannons are equipped with automatic electronic timers which allow growers to program the operating hours of the unit. These timers, unlike older light-activated photocell timers, provide the flexibility of allowing the unit to be turned on and off during the day when birds may not be feeding as heavily.

Guidelines on the use of propane-fired cannons are:

- Set at intervals greater than 3 minutes.
- Use between sunrise and sunset when birds feed.
- Operate no more than one unit per 2 ha (5 acres), unless it is absolutely necessary.
- Avoid operating near neighbours' houses.
- Ensure that propane tank valves do not leak, as this can cause units to blast unintentionally, even when they are shut off.
- Move the units around to keep the birds off-guard.
- Use electronic clock timers that automatically shut off the units.

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Figure 2. The propane-fired, bird-scaring cannon is irritating to birds, but can be irritating to neighbours as well.

2. Electronic Sound Devices

Electronic sound devices are considered less irritating to neighbours than propane-fired cannons. There are two types currently used that broadcast electronic synthetic sounds to repel birds:

- random noises, irritating to birds (traditional)
- reproduced distress calls that mimic individual bird species.

The traditional electronic sound device is often referred to as the AV Alarm®, a trade name that has been familiar in the industry for 30 years (Figure 3). Their electronic, warbling sound interferes with the bird's sensory system, producing an environment that makes birds uncomfortable and insecure. In some cases, the birds are unable to communicate with each other freely and will leave the area. These units work well when used in a combination with propane-fired cannons. The electronic sound device keeps the birds irritated and edgy, while the cannon provides the stimulus to drive them away.

A new generation of electronic sound devices uses digital technology to produce distress calls of specific birds (Figure 4). They are only effective against the bird species whose distress calls are encoded on the microchip. However, some residual repellent effect may be noticed on species that normally travel together with the target birds. Some farmers report that digital units also attract birds of prey, such as hawks, who misinterpret the electronic distress calls for the real thing. Hawks circling the farm will also scare away birds. Even though these units produce electronic bird distress calls, they sound to us like real birds, and are usually not as objectionable to neighbours. These devices also produce a lower decibel sound level than the more traditional units.

Both types of electronic sound devices can be used to discourage birds from nesting in nearby trees in the spring.

Figure 3. The electronic AV Alarm*;* makes sounds that interfere with a bird's sensory system (shown in sweet cherry orchard).

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3. Whistling and/or Pyrotechnic Pistol Cartridges

These are cartridges that are launched from a hand-held pistol and produce a loud, whistling sound throughout their flight. There is also a delayed reaction banger cartridge that travels through the air in silence, then explodes high in the air near flocks of birds as they are flying with the same sound level as a propane-fired cannon. Shooting these ear-piercing sounds into a flock of birds works well as a repellent. These units can quickly clear a field, woodlot or hydro line before the flock lands on the crop. Airports often use

this type of equipment, but they are especially popular with farmers, and may be the most effective manual scaring device available.

Figure 4. The electronic distress call unit frightens birds away and can attract hawks to circle the area.

4. Shotguns

Shotguns are often used to repel birds, but they are not as effective as launching the sound directly into the flock like the pyrotechnic units. Although shotguns might provide a frustrated grower with a form of stress relief, even an excellent marksman will never seriously reduce the bird population. Shotguns should only be used by trained, responsible people to ensure no one is hurt. Firearm Acquisition Certificates are required for shotguns, but not for pyrotechnic pistol cartridges.

5. Other Sound-Producing Devices

Many other sound producing devices or strategies have had only limited success. These can include air horns, clanging aluminum pie plates, shiny flashing metal objects, firecrackers and Mylar humming lines. These devices generally work only for a few days before the birds start to ignore them again. They might be most effectively used in the days just before harvest when bird pressure is the greatest.

Visual Repellents

Birds generally have very good eyesight and react to both movement and things that resemble their enemies. However, birds do not react nearly as much to visual deterrents

as they do to acoustical ones. Visual deterrents are usually add-ons to acoustical systems, and they rarely provide sufficient protection by themselves.

1. Scare-Eye Balloons

The beach ball size scare-eye balloons with their graphics depicting the gaping mouth of a hawk, have proven themselves worldwide (Figure 5). They are manufactured in white, black and yellow. For Ontario, the best bird scaring results have been with yellow scare-eye balloons. Blackbirds do not like the colour yellow. Sparrows and finches are repelled to a lesser extent, while robins and cedar waxwings are hardly repelled at all. Scare-eye balloons must be suspended above the crop and must move freely with the wind to look more realistic.

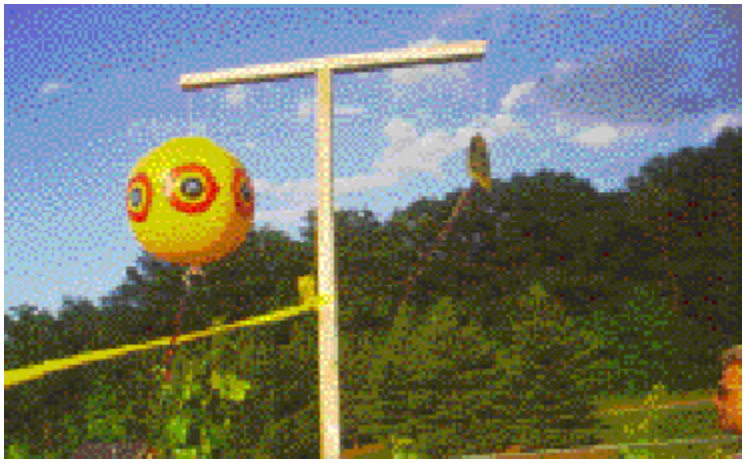

Figure 5. Scare-eye ballons must be installed above the crop, moving freely with the wind.

2. Streamers And Flashtape

Streamers and flashtape are strips of shiny plastic tape which are strung over crops (Figure 6). They move with even the slightest breath of wind and also reflect sunlight. From above, the birds view an entire vineyard or orchard that appears to be in motion. Flashtape is available in yellow for blackbird species and in a red/silver combination for repelling a broad range of species. It is especially effective to string streamers and flashtape along perimeter rows where the most severe damage occurs, or in other areas that need additional protection.

Figure 6. Streamers and flashtape move in the wind and, from above, the field appears to be in motion.

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3. Flashing Lights And Mirrors

Some bird species, notably starlings, are repelled by flashing lights and mirrors. Flashing lights are only effective at dawn or dusk when the natural light is dim, and mirrors are only effective when the sun is shining. Some growers have mounted mirrors on top of rotating propane-fired cannons and from above, the mirrors appear to be moving. Farmers have reported a repelling effect on sunny days.

4. Hawk Silhouettes, Stuffed Owls And Snakes

Most of these bird repellent materials have only a limited effect for a short period of time. Some farmers report they have seen birds nesting right on these devices.

5. Falconry

Trained falcons and hawks have been used successfully for many years at airports. Unfortunately, the effect only lasts as long as the falcons and hawks are airborne. The major drawback is cost, time and availability, since growers cannot do this work themselves. Trials using birds of prey tethered to a post have failed because nuisance birds quickly realize the falcon or hawk is powerless to attack.

Physical Exclusion

Forcibly keeping birds away from the crop using netting is the best way to ensure crop protection. Unfortunately, it is usually the most expensive option.

1. Netting

Traditionally, netting has been associated with high capital costs and high labour costs. The cost of netting materials has been dropping over the years and the systems available for applying the nets are improving. Nets are becoming especially attractive because of the high value of wine grapes. Nets offer virtually 100% bird protection and help maximize yields. Bird netting is available in a lightweight one-use formulation or heavier multi-use ultraviolet protected materials. There are rigid or stretch materials and different widths and mesh sizes. The choice of material will depend on the type of crop and layout, expected material life, and the type of equipment available for installing and retrieving the net.

There are two ways netting can be applied to crops:

- draped directly on top of the crop (or trees), or
- fastened to an overhead structure which totally encloses the vineyard, orchard or berry patch.

Draping the net directly over the crop is best suited for crops which do not require multiple pickings, such as grapes. It is labour intensive to both install and remove netting that tangles with the plant. For ice wine grapes, the net is draped completely around the vines and fastened tightly under the lowest bunches. Here it serves two purposes - protecting the grapes from birds until harvest in mid-winter, and keeping the grapes from dropping on the ground during the long period until harvest (Figure 7). For ice-wine, netting is a necessity.

Overhead netting systems are not common in Ontario, but there may be more interest in them in the future, as easier methods of installation and operation are found (Figure 8). These systems would be most effective for blueberries or dwarf, early variety sweet cherries that are now being planted in Ontario. High value wine grapes in heavy bird-pressure areas would also be a logical candidate provided a method of using mechanical harvesting equipment under the structure is found. Overhead netting systems are not recommended for late harvest or ice wine applications, since they are not strong enough to withstand snow or ice loading. Nets must be removed or at least retracted at the end of the season to protect them from ultraviolet degradation and snow loads.

Figure 7. Netting installed directly over the crop is labour-intensive, but effective.

Figure 8. Netting installed on an overhead structure over blueberries.

Chemical Repellents

Over the years, many chemical bird repellents have come and gone, partly due to lack of effectiveness, but also because of adverse health side-effects. At present, there are no effective, food grade chemical bird repellents registered for use in Canada. Research and field tests on a new formulation using grape flavour extracts as the active ingredient are being undertaken in the USA. Findings to date have shown that this product will not be acceptable on wine grapes due to residual flavours in the wine which arise during the fermentation process.

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Deciding on the Best Bird-Control Strategy

Many growers hope that there is a single magic solution to their bird control problems. However, simply using existing bird control methods more effectively may be all that is needed. Follow these four steps:

1. evaluate your bird problem
2. use an integrated approach
3. start early with a control program
4. avoid predictable control patterns

Evaluate Your Bird Problem

This may seem very basic, but growers need to know how birds think and act, in order to control them.

- What birds are causing the major problems?
- What other sources of food are in the vicinity?
- What direction are the birds flying in from?
- Are the birds migratory, or nesting nearby?
- What time of day do you have most problems?
- Where might the birds go instead of your place?

Use an Integrated Approach

Growers must realize that using only one deterrent system will not work. Instead, consider the following points when planning a control strategy:

- Use scaring methods in combinations that disrupt the bird's sense of sight, sound, and instill fear, or reinforce a fear association
- New and unfamiliar control methods work well initially, but decline in effectiveness over time
- Devices with different scaring techniques complement each other
- Random, unexpected noise is always better than predictable, patterned noise
- Position more scaring devices along the perimeter of vineyards/orchards/patches, near trees/ponds, and at flight pattern entry areas
- Farms along hill faces (e.g., Niagara Escarpment) benefit from the echoing effect of propane-fired cannons and electronic sound devices
- Use prevailing winds to your advantage to maximize sound dispersal
- Electronic sound devices and propane-fired cannons should be installed to direct sounds as close to the fruiting zones as possible

The potential for birds to damage the crop varies from farm to farm. The more situations that could attract birds, the greater is the potential bird pressure. The checklist in Table 2 can be used as a guideline to see whether birds are likely to be a problem. Put a check mark after each of the situations that apply for any vineyard, field or orchard that has bird pressure.

For growers with no check marks in Table 2, the bird pressure can be considered to be low. For two or three check marks, the bird pressure is medium. With four or more check marks, the bird pressure can be considered to be high.

Table 2. Predicting Bird Pressure Level on Farms
(The more of these situations in the vineyard, field or orchard, the higher the bird pressure.)

Situations	Mark with a check if on your farm.
Adjacent tree lines, bush or woodlots	
Source of water nearby	
In flight path of migrating birds	
Best source of food in vicinity	
No nearby growers protecting crops	
Early-ripening fruit or super sweet grapes	
No regular human activity around crop	

The grape industry is the biggest user of bird control devices on Ontario farms. Table 3 gives one set of guidelines for bird control on a 4 ha (10 ac) vineyard, depending on the bird pressure level. The 50 rows are 290 m (950 feet) long at a 2.75 m (9 foot) spacing.Table 3 should be used as a guideline only, as every vineyard will be different and there are many possible options.

Table 3. Suggested Bird Control for 4 ha Vineyard

Bird Pressure	Equipment Suggested
Low	• 2 propane-fired cannons + tanks • 2 electronic scarers + 12 Volt batteries
Medium	• 2 propane-fired cannons + tanks • 3 electronic scarers + 12 Volt batteries • 20 scare-eye balloons + poles • 1500 m (5000 ft) flash tape + poles • 1 pyrotechnic pistol + cartridges • Netting over outer 2 rows (4 rows total)

High	• 14500 m (47,600 ft) netting over rows

Start Early With a Control Program

Once birds have a taste of your delicious crop, it is difficult to break their habits. Therefore, you must stop the birds from getting an initial foothold on the farm. During the nesting season, some birds can be convinced to settle elsewhere by using electronic bird scarers in the nesting area. Growers often start their bird control program too late, after the birds have already tasted the crop. Bird control equipment *must* be in place at least 10 days before the crop is attractive to the birds, usually when it is colouring, softening, or sweetening, depending on the crop. For early control, propane-fired cannons or electronic bird scarers should be set to run infrequently. This might be an interval average of 10 minutes for the randomized firing/sound sequences. For a typical control season of 8 weeks, the interval average should decrease about 1 minute per week. However, as stated earlier, the interval average should never be less than 3 minutes, since this would reduce the equipment's effectiveness.

Avoid Predictable Control Patterns

- keep the birds off-balance by using a random approach to combinations of acoustical, visual and physical exclusion control methods
- although not commonly done by farmers, propane-fired cannons and electronic bird scarers must be moved to different locations at least weekly
- move scaring equipment immediately if it does not appear to be working

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Propane-Fired Cannons and Your Neighbours

Noise is unwanted sound. Propane-fired cannons and electronic bird scarers are probably the only devices ever created whose sole function is to produce an irritating sound. If they are irritating to birds who have the option to escape to a quieter place, then they are probably very irritating to neighbours who do *not* have that option. When noise problems develop between a farmer and the neighbours, they can result in confrontation. The best solution is to avoid problems before they develop. See OMAFRA Factsheet, *Noise Control on Farms*, Order No. 96-033 for information on noise measurement and abatement.

Most complaints about bird scaring devices involve propane-fired cannons. People describe the sound as feeling it in your stomach when it fires. Some find themselves stressed from feeling helpless about their situation, or counting the seconds and cringing in anticipation of the next shot. Noise measurements taken beside a propane-fired cannon are at about 115 dB. This is louder than standing beside a noisy chainsaw.

Here are some observations about neighbours and their concerns about propane-fired cannons:

- Even though there may be several farms and several cannons operating in an area, the one that is visible is usually blamed for the noise.
- When neighbours learn that cannons should not operate before sunrise or after sunset, they think official, radio times for sunrise and sunset, which may differ from bird feeding times.
- Complaints about cannons rise over time if nothing is done about it.
- It may be "normal farm practice" to use cannons on grape and tender fruit farms, but possibly not in the vicinity of several nearby houses.

To help reduce, but not necessarily eliminate complaints from neighbours, explain to them why cannons are needed and show them how they work. They may have some good ideas about how to control birds themselves. Given a chance to have input, some neighbours might complain less about the equipment.

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Case Study

Suppose a 4 hectare (10 acre) vineyard needs bird protection. There are 50 rows of grapes 290 m (950 feet) long at a 2.75 m (9 feet) spacing. What would the annual principal and operating costs be for all three levels of protection, assuming the following circumstances?

- Low bird pressure: None of the situations in Table 2 are present
- Medium pressure: Adjacent bush, source of water nearby, in flight path of migrating birds
- High pressure: All of situations in Table 2 are present

Assumptions

- use the same equipment as shown in Table 3
- cannons, electronics and netting financed at 7%
- equipment lasts 10 years; netting 5 years if used carefully
- tapes and balloons last 2 years
- $10/hour for farm labour
- 8 weeks protection required during preharvest period (ice-wine would have a longer protection period)
- utility tractor at $35/hour including fuel
- utility tractor, with net roller, including fuel, at $40/hour
- cannons and electronic scarers moved weekly
- labour estimated at 7 hours/cannon or electronic scarer to install, repair, move weekly; balloons at 0.5 hours each; tape at 1 hour/300 m installed; netting at 4 hours/300 m to install and remove (labour requirements can vary widely, so use these figures as guidelines only)

Table 4 summarizes the costs of protection for the three levels of bird pressure. For a high value grape such as Cabernet Franc, worth about $1,700/tonne ($1,545/ton), and yielding about 10 tonnes/ha (4 tons/ac), the total gross farm yield is about $68,000 annually, or $17,000/ha. To break even, the bird scaring equipment would have to protect enough crop to make it worthwhile.

Table 4 summarizes the annual principal, operating, total and per hectare costs for the bird scaring equipment. Then, it compares the total annual costs/ha as a percentage of the expected gross value of the grapes produced on each hectare. The low level protection costs about 1.3% of the total gross value of grapes harvested. The high level protection costs about 6.9% of the total gross value of grapes harvested. Obviously, the higher the value of the crop, the easier it is to justify bird control equipment.

Table 4. Annual costs to protect 4 ha of high-value grapes worth $1,700/tonne (low, medium and high bird pressure)

	Low Level	Medium Level	High Level
Principal $/year	$320	$725	$1,800
Operating $/year	$580	$1,225	$2,900
Total $/year	$900	$1,950	$4,700
Total $/ha/year	$225	$490	$1,175
Gross $/ha/year	$17,000	$17,000	$17,000
% Gross (control)	1.3%	2.9%	6.9%

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Conclusions

Once birds establish, they are difficult to deter from feeding on your crop. Control starts by understanding how birds behave and it needs to start early in the season. It should be proactive and dynamic. Try to balance the needs of the crop, the economics of various control methods, and the best interests of the neighbourhood and environment.

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