http://ipm.osu.edu/fruit/index.html

THE OHIO STATE UNIVERSITY Newsletter Extension

Fruit ICM News

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Calendar

December 19, 2001: Eastern Ohio Fruit School will be held at the OSU Extension-Muskingum County office meeting room in Zanesville. Speakers and topics include Mike Ellis: Fruit Disease and Fungicide Update, Christie Welch: Pruning Brambles, Dick Funt: Small Fruit Update, Rob Leeds: Getting Started in Entertainment Farming, Diane Miller: New Apple Cultivars for Ohio, and Bill Huston: Non-insured Assistance Program (NAP) Update. Registration begins at 9:30 a.m. While free, registrations are needed by December 14. The office is located at the corner of I-70 and Underwood Street. For more information contact Mark Mechling at 740-454-0154 or e-mail mechling.1@osu.edu.

January 10, 2002: MSU Bramble School, Kalamazoo, Michigan. For more information contact Al Gaus at 616-944-4126, Bob Tritten at 810-732-2177, or Gary Thornton at 231-946-1510.

January 28-30, 2002: Indiana Horticultural Congress, Indianapolis. For more details visit http://www.hort.purdue.edu.

February 6-8, 2002: Ohio Fruit and Vegetable Growers Congress, Toledo Seagate Convention Centre & Radisson Hotel. Plan to attend educational sessions on small fruit, tree fruit, cider, truck crops, potatoes, processing vegetable crops, greenhouse vegetables, and direct agricultural marketing. General sessions include OFB Workers' Comp group rating program safety session, crop protection adjuvants, stickers & technology, food safety, and changes to Ohio Uniform Food Safety Code. Visit the trade show featuring over 100 exhibitors serving fruit & vegetable growers & direct agricultural marketers. Visit http://www.ohiovegetables.org and http://www.ohiofruit.org for more details.

Wildlife Control in Fruit Crops

Adapted from the Pennsylvania Tree Fruit Production Guide http://tfpg.cas.psu.edu

Voles

Identification
Voles are small rodents with short legs, stocky bodies, small eyes and ears, and short tails. Two species, the meadow vole (Microtus pennsylvanicus) and the pine vole (Microtus pinetorum), may damage fruit trees and become serious pests in orchards.

The meadow vole is approximately 5.5 to 7.5 inches long. It has brown fur mixed with black, and its tail is approximately twice the length of its hind foot. The meadow vole is also called the meadow mouse. The pine vole is Ohio's smallest vole. It is 4 to 6 inches long and has chestnut or auburn fur and a short tail approximately as long as the hind foot. The pine vole is also called the woodland vole.

Distribution
The meadow vole is one of the most widespread mammals in Ohio. It abounds in grassy fields, moist meadows, orchards, or any area with a dense groundcover of grasses. Pine voles are most abundant in old fields, thickets, gardens, orchards, and the edges of agricultural land, particularly where the soil is loose and sandy.

General biology and behavior
Voles are vegetarians, feeding on grasses, tubers, and seeds. They also consume the bark of young trees. Unlike many other small mammals, voles do not hibernate. Instead, they are active throughout the year, both day and night, with peak activity at dawn and dusk.

Meadow voles create surface runways in the grass, and in winter they are active in these runways beneath the snow. Pine voles build underground tunnels in loose, crumbly soil. As they build the tunnels they push out dirt, producing small conical piles of soil on the ground surface. Both voles build large globular nests of dry grasses and leaves. The nests are located close to tree trunks, in tussocks of grass, and at the end of burrows.

Voles are extremely prolific. Their peak breeding activity occurs between March and October, but when winters are mild, voles may breed all year long. A female meadow vole could potentially produce over 70 young in a year, and the young voles become sexually mature at the age of 1 month. As a result, under ideal conditions vole populations can reach densities as high as 270 voles per acre. Scientists have found that voles exhibit regular population fluctuations at approximately 4-year intervals. Populations apparently crash to levels as low as 10 voles per acre after peak years and then begin to build up again. Extensive damage may occur in orchards, particularly during peak population years.

Damage
Voles may cause extensive damage to fruit trees and orchards as a result of girdling seedlings and trees and damaging roots. Damage occurs primarily during winter when other types of food are scarce. The most common form of tree injury caused by meadow voles is trunk girdling at or near the ground surface. Since voles burrow in the snow, they may damage tree trunks as high as snow accumulates. Young trees are especially susceptible to attack. Occasionally meadow voles will burrow in the soil and damage roots, resulting in weak, unhealthy trees.

Damage from pine voles is harder to detect, because it occurs underground as voles consume small roots, girdle large roots, and eat bark from the base of trees. By the time orchardists note weak, unhealthy trees, the damage is already extensive.

Monitoring

The most easily identified sign of meadow vole presence is a system of surface runways in the grass. Meadow voles create these runways by their feeding activities and keep them free of vegetation. The runways are generally about 1 1/2 inches wide. Bits of freshly cut vegetation and accumulations of vole droppings (brown or green in color and shaped like rice grains) in the runway are positive evidence they are being used. Vegetation, small roots, or mold in the runways indicate that the voles are no longer using them. Pine voles do not use surface runways, so their presence is much harder to detect. In apple orchards, tiny, elongated tooth marks on apples on the ground are signs of both meadow voles and pine voles.

The apple indexing method is a way to determine the distribution of voles in an orchard and their relative abundance. Place an apple with a slice removed into a meadow vole runway or in a pine vole tunnel. Check the apple after 24 hours for vole tooth marks. The presence of tooth marks will indicate where vole activity is highest and which trees are at risk. To obtain an estimate of the abundance of voles, weigh the apple before putting it out and again after 24 hours. One pine vole consumes approximately 13 grams of apple in a 24-hour period, and one meadow vole consumes about 20 grams.

Most orchardists do not need to know the exact number of voles present, but they may want to know whether the population is increasing or decreasing, or whether a particular treatment had an impact on population size. Monitoring vole numbers with the apple indexing method is a means of achieving these goals.

Trapping can also be used to assess the effectiveness of a vole-control program. Before initiating the control program, select approximately 10 trees and place four wooden-base (mouse-sized) snap traps in runways near these trees (for trap placement see section on trapping below). Record the number of voles trapped in a 3- to 5-day period. After the control program is finished, set the traps in the same place and, for the same length of time, compare the number of voles caught after treatment with the number caught before treatment. If the program has been successful, you should trap no more than two or three voles.

The number of voles that can be tolerated is a trade-off between cost of control and cost of damage, and it depends on the orchardist. A single vole may cause damage, but most damage occurs at high population levels. Monitoring vole populations enables growers to assess when populations are starting to increase and to begin control programs at that time.

Management

Biological control:

Hawks, owls, shrikes, snakes, weasels, raccoons, foxes, opossums, and house cats all feed on voles. These predators are beneficial in orchards because they help keep vole populations under control. Whenever possible, orchardists should encourage these predators, or at least not harass or kill them.

When natural controls are inadequate, artificial methods must be used to control vole populations. The fall is the best time for initiating control programs. A number of different control methods are listed below. The greatest success is usually achieved by using a variety of techniques at once.

Habitat modification :

In orchards, the major food sources for voles are normally not the fruit trees, but roots and stems of grasses and other groundcover. As a result, habitat modification, that is, reducing or eliminating grasses and cover, is one of the best long-term methods for controlling voles. Repeated mowings that maintain groundcover at a height of 3 to 6 inches serve to limit both food and cover and expose voles to

predators. Where possible, mow both between trees in a row as well as along tree rows. Too much delay between mowings results in excessive vegetation which, when cut (especially with a sickle-bar mower), forms a thatch layer that protects voles. A flail or rotary mower is preferred for reducing thatch.

Establishing vegetation-free zones under tree canopies that extend at least 2 feet from tree trunks will discourage voles from living near the bases of trees, where they cause the most damage. Vegetation-free zones may be established by mowing, applying herbicides, cultivating, or placing a layer of crushed stone or gravel 3 to 4 inches deep that extends 15 to 18 inches from the trunk. Do not allow mulch, prunings, or decaying vegetation to accumulate around the bases of trees or in tree rows.

Exclusion:
Hardware cloth barriers can be used to keep voles from girdling small trees. Wrap a strip of 1/2-inch or less mesh hardware cloth around the base of small trees. The hardware cloth should be set 4 to 6 inches into the ground and be approximately 18 to 24 inches high. Use higher guards where snow may be deep. Tree guards should be large enough to allow for 5 years of growth. This method is very effective, but extremely labor intensive and expensive when a larger number of trees need protection.

Trapping:
Trapping is not an efficient way of controlling voles in large orchards, but it is an effective and safe control method for small orchards or around selected trees. Use standard wooden-base snap traps (mouse sized) and bait them with peanut butter, oatmeal, or apple slices. For meadow voles, place the traps in runways flush with the ground and perpendicular to the runway. Place the trigger end in the runway. For pine voles, locate a tunnel and place the trap within the tunnel and perpendicular to it.

Toxicants:
Used in conjunction with habitat modification, rodenticides are an important component of most control programs because they provide the quickest and most practical means of bringing large populations of voles under control. Several rodenticides (ZP Rodent Bait AG, Rozol Paraffinized Pellets, Ramik Green, Hopkins Zinc Phosphide Mouse Bait, and Hopkins Zinc Phosphide Pellets) are currently registered for use in Pennsylvania orchards. To determine if a specific rodenticide can still be used, read the label very carefully. The label will provide information on rates and applications, and list legal uses for the product. Note any restrictions placed on the product. Most rodenticides may be used only during the dormant season, when trees are not bearing fruit. If the label does not specifically state that it is legal for use in orchards, you can call the Department of Agriculture, Division of Agronomic Services, 717-772-5211, and ask them to check if the product is registered for use in Pennsylvania orchards.

Bait type is an important consideration in vole control programs. Acute rodenticides, such as those containing zinc phosphide, are fast-acting poisons that usually require only a single feeding to achieve a lethal dose. In contrast, chronic rodenticides, which include anticoagulants such as those found in Rozol pellets, require multiple feedings over a period of several days before a lethal dose is achieved.

Both acute and chronic rodenticides are available in pelleted bait formulations, which are superior to grain baits because they are more effective against voles and are not as hazardous to ground-feeding birds and other nontarget wildlife.

Bait shyness occurs when animals consume sublethal doses of acute toxicants, then develop an aversion to the bait. Therefore, growers are advised not to apply zinc phosphide baits more often than once every 6 months. Ideally, growers can reduce the pest population with an initial application of a zinc phosphide bait and then after 2 days conduct an apple-slice index to assess the need for a follow-up application with an anticoagulant bait.

Recommended application rates for acute rodenticides are 2 pounds per acre when hand-placing zinc phosphide pellets in runways and 10 pounds per acre for broadcast application.

Recommended application rates for chronic rodenticides are 10 pounds per acre when hand-placing pellets or 15-20 pounds per acre for broadcast applications. Chronic rodenticides may be reapplied 30 to 60 days later if the vole problem persists.

Bait placement is critical to the success of a control program. Broadcast distribution of pellets and hand placing of pellets at recommended rates will work, but the best results are achieved by using bait stations. In addition, bait in stations is less available to nontarget wildlife.

Bait stations can be made from discarded beverage cans. Enlarge the opening in the end of the can so that it is about 1 1/2 inches in diameter. Dent the side of the can. Put bait in the can and place the can, dented side down, in the area to be protected. Mark the bait containers with flags or stakes so they can be relocated. Another type of bait station that has been successful is made from an automobile tire split longitudinally. Tires are placed with the hollow side down, and the bait is placed in a small cup under the tire. The tire halves are then distributed one per tree or one every 10 yards throughout the area. Discontinue use if nontarget animals are coming into contact with bait.

Pine voles are not as active aboveground, so bait should be placed directly in runways and burrow openings at two to four locations under infested trees. If runways and burrows cannot be found, roofing shingles, boards, or other objects placed on the ground at each placement site provide voles with shelters where they may build tunnels or nests. Place bait under these shelters after they have been in place for several weeks.

Timing also influences the success of control programs. Wet weather reduces the effectiveness of rodenticides, so apply baits when weather is likely to be fair and dry for at least 3 days. Baits are most effective when naturally occurring foods, such as green vegetation and fruit drops, are limited. Late fall is an important time to bait voles because it serves to reduce populations before the onset of winter, when vole damage is most severe and snow cover precludes rodenticide use.

When winter survival is high, baits should be applied in the spring before the breeding season and before renewed growth of groundcover diminishes bait acceptance. Most rodenticide labels stipulate that bait can only be applied during the dormant season, after harvest, and before bud burst in the spring.

Sources of supply:

Bell Laboratories, Inc.
3699 Kinsman Boulevard
Madison, WI 53704
608-241-0202
(ZP Rodent Bait AG)

Liphatech
3600 W. Elm St.
Milwaukee, WI 53209
414-351-1476
(Rozol Paraffinized Pellets)

HACCO, Inc

P.O. Box 7190
Madison, WI 53707
608-221-6200
(Hopkins Zinc Phosphide Mouse Bait/Pellets, Ramik Green)

Miller Chemical and Fertilizer Corp.
Box 333
Hanover, PA 17331
717-632-8921
(Hot Sauce Animal Repellent)

White-Tailed Deer

Distribution
The white-tailed deer is one of the most widely distributed and well-known mammals of North America, and it is a common species throughout Pennsylvania. Deer prefer early successional forests that are in the shrub-tree sapling stage. They are also abundant in agricultural areas where field crops and orchards are interspersed with forest habitat.

General Biology and Behavior
Deer are most active during early morning and evening hours. They have a home range of several hundred acres, but this varies with season, habitat, sex, and even individual characteristics. Whitetails are creatures of habit; most use the same home range year after year. They also tend to establish one part of their home range as a feeding area, and another part for resting. For instance, if deer establish an orchard as a source of food, they will habitually move into the area a little before sunset to feed, and move back to the woods before dawn to rest.

The natural food habits of deer depend on the time of year and the plant species available. During the winter months, deer consume evergreen and dry leaves, as well as dormant buds. In the spring and summer they eat new growth on woody and herbaceous plants. From late summer to early winter, fruits and nuts compose a large part of a deer's diet.

White-tailed deer mate from September to late January. Adult bucks are polygamous, mating with as many does as possible. A doe's reproductive ability is influenced by her age and nutritional condition. Adult does will usually bear twins, while younger does more often bear single fawns.

Damage
Deer cause damage to orchards year round, but the most serious damage occurs in the winter months when the availability of natural foods is limited. Dwarf, semidwarf, and young standard fruit trees are the most susceptible, because most of the tree is within reach of the deer. In winter, browsing on dormant terminal buds may lead to stunted or misshapen growth in standard fruit trees under 3 years old. Browsing on fruit buds of dwarf and semidwarf trees may lower fruit production. In either case, severe winter browsing can reduce tree vitality and even cause death.

During the spring and summer, natural sources of forage are readily available to whitetails. However, they may browse new growth on orchard trees and eat ripening fruit. In autumn, deer may continue to browse and eat fruit within the orchard. Additionally, they can cause severe damage by rubbing their antlers on trees. This can result in broken limbs and girdling of the trunk if the deer removes enough bark.

Monitoring
The extent of damage caused by deer can be monitored through direct and indirect observation. They may be caught "in the act" during active periods of evening and early morning. Indirect observation means recognizing signs that deer leave behind. Whitetails selectively browse leaves and twigs from various plants, but prefer some species over others. In spite of this preference, they may heavily browse one plant, while ignoring another of the same species that is close by.

Lacking upper incisor teeth, deer characteristically tear off vegetation, leaving jagged edges that you can use to identify browsed trees. In comparison, browsing by rodents and rabbits leaves a clean-cut surface. However, the height of the damage may be all you need to eliminate any mammal other than deer. Another method for determining deer as the source of damage is to search for tracks. They leave a distinctive split-hoofed track that can easily be seen in damp soil or snow. Monitoring your orchard for damage is an important, ongoing process and the first step in a successful management plan.

Management
Effective management begins by anticipating the extent of damage and responding with the appropriate control. The easiest way to predict damage is to combine the past year's damage with The Pennsylvania Game Commission's estimate of deer density in your area. For example, if deer density is on the increase, you can expect that damage to your orchard will also increase.

Before deciding on a control method, if any, you should consider the cost benefits of the control program. If the damage you incur is economically greater than the cost of a control measure, you should apply the control measure. In many instances, an integrated pest management (IPM) plan is the best approach. This strategy combines ongoing population management of the local deer herd with either repellents or fencing, depending on the extent of damage.

Hunting:

In Pennsylvania, the white-tailed deer is a protected game species. The Game Commission is authorized to manage the size of the deer herd through regulated hunting of antlered and antlerless deer. The hunting season is designed to remove enough deer from the herd to create a balance between deer numbers and available browse. Changes in deer range and population are taken into account to adjust the yearly deer harvest and decrease the risk of excessive agricultural damage. As a landowner, you should encourage hunting in your area, especially if your orchard is subject to heavy deer damage. Posted areas serve as refuges for deer during the hunting season and may compound the damage to an orchard by concentrating the deer population.

If a commercial orchard is your primary means of gaining a livelihood, those members of your immediate family living on the premises, as owner, lessee, or tenant, as well as any regular hired help, may hunt without a license during regular hunting season on the property, and on detached lands within 10 air miles from the home orchard that are operated under written lease as part of the same operation. This applies only to persons who are otherwise eligible to be issued a hunting license. Consult your local Wildlife Conservation Officer for information on opening your land to hunters, or on eligibility requirements for hunting.

Shooting:

Even though your land is open for hunting, you may still experience problems with deer when they are no longer in season. Because of this, you may kill any deer witnessed to be causing or about to cause damage to your orchard, outside of the regular hunting season. It is good practice to notify your local

Wildlife Conservation Officer when you plan to shoot deer. There are procedures and regulations that you must follow if you are planning to protect your orchard in this manner. If the property is open to hunting, the orchard owner may keep one deer for personal use; all other deer should be field-dressed and turned over to the Game Commission for distribution to local food banks. If the land is not open to hunting, all deer should be field-dressed and turned over to the Game Commission. Be sure to contact the local Wildlife Conservation Officer before you act, to ensure complete understanding of all the regulations.

Repellents:
Repellents are most effective when integrated into a damage control program that includes repellents, fencing, and hunting. Apply repellents at the first sign of damage to prevent deer from establishing a feeding pattern at the site. There are two types of repellents: area and contact. Area repellents repel deer by odor and are applied close to plants in need of protection. By applying the repellents along the orchard borders, you can protect many acres of trees at a relatively low cost.

Area repellents include tankage (putrefied meat scraps), ammonium soaps, bone tar oil, blood meal, and human hair. Contact repellents work by taste and must be applied directly on the plant. These repellents work best if you apply them in the dormant season on dry days when temperatures are above freezing. Examples of contact repellents are putrescent egg solids, thiram, and hot pepper sauce. Remember, whenever you apply a commercial repellent, the law requires strict compliance to the label.

Repellents have variable results; what works for one grower may not work for another, and success differs from year to year. Some repellents do not weather well and require repeated applications during the season. Also, if deer are very hungry and the area lacks other more palatable food resources, they may ignore the repellents. Success must be measured by how much the damage has been reduced, since it is rarely eliminated. In areas where deer density is low and damage is light, repellents may be a cost-effective part of your IPM strategy.

Fencing:

Fencing deer out of the orchard is the most efficient way to reduce damage when deer density is high and damage extensive. The conventional 8-foot woven-wire fence effectively excludes deer by forming a barrier around the orchard. The fence consists of two widths of 4-foot woven wire and 12-foot posts. To prevent deer from crawling under, keep the wire close to ground level. Unfortunately, deer-proof fencing is expensive, but it is effective, long-lasting, and requires little maintenance.

An alternative to barrier fencing is the use of an electric fence. This type of fence is designed to change the deers' behavior. Although deer can easily jump an electric fence, they will instead try to go through or under. An electric fence takes advantage of this behavior and successfully trains the deer to stay 3 to 4 feet away from the wires.

Researchers at Penn State have developed a low-cost, five-wire electric fence. Through tests conducted statewide, the design has shown to be an adequate means of deer control. The fence incorporates high-tensile steel wire; in-line wire strainers; and high-voltage, low-impedance energizers. High-tensile fence can absorb the impact of deer and tree limbs, thereby eliminating some of the problems associated with softwire fences. In addition to Penn State's five-wire fence, other high-tensile electric fence designs are available.

The disadvantages of electric fences are that they require high maintenance and regular inspections. You must maintain a 6- to 8-foot mowed strip along the fence perimeter to discourage deer from jumping and

to decrease the weed load on the fence. You must also check the electric current regularly to ensure that the shocking power is sufficient for turning the deer. The advantages include a relatively low cost and, when properly maintained, a long-lasting fence.

Most nurseries and home centers sell commercial repellents and fencing materials. Some companies that manufacture repellents and the product they supply are listed below.

Pace International LP
1011 WEstern Avenue
Suite 505
Kirkland, WA 98104
(Hinder, Hinder-H)

Miller Chemical and Fertilizer Corp.
Box 333
Hanover, PA 17331
(717) 632-8921
(Hot Sauce Animal Repellent)

J. C. Ehrlich Chemical Co.
P.O. Box 13848
Reading, PA 19612-3848
(800) 488-9495
(Magic Circle)

Bonide Products, Inc.
2 Wurz Ave.
Yorkville, NY 13495
(315) 736-8231
(Repellent and Bulb Saver)

Nott Manufacturing
P.O. Box 685
Pleasant Valley, NY 12569
(914) 635-3243
(Chew-Not)

Gustafson, Inc.
Box 660065
Dallas, TX 75266-0065
(972) 985-8877
(Thiram 42-S)

IntAgra, Inc.
8906 Wentworth Avenue
Minneapolis, MN 55420
(800) 468-2472
(Deer-Away)

Preliminary Monthly Climatological Data for Selected Ohio Locations November 2001

Weather Station Location	Monthly Precip.	Normal Monthly Precip.	Year-to-Date Precip.	Normal Year-to-Date Precip.	Average High	Normal High	Average Low	Normal Low	Mean Temp.	Normal Mean
Akron-Canton	2.83	3.01	30.56	33.87	56.9	49.7	37.5	34.2	47.2	42.0
Cincinnati	3.31	3.46	42.50	38.18	61.4	53.3	38.5	35.3	50.0	44.3
Cleveland	2.62	3.17	31.83	33.54	57.3	50.0	40.3	35.0	48.8	42.5
Columbus	3.69	3.22	33.86	35.23	59.9	51.4	39.3	34.3	49.6	42.9
Dayton	2.86	3.07	38.54	33.71	59.0	51.3	38.1	34.4	48.5	42.9
Fremont	1.74	2.78	30.47	31.97	58.8	49.3	35.1	32.1	46.9	40.7
Mansfield	3.18	3.51	31.47	36.58	57.0	49.2	38.2	33.9	47.6	41.6
Norwalk	2.35	2.91	29.75	32.87	58.0	49.8	37.6	33.0	47.8	41.4
Piketon	4.24	3.0	25.17	38.8	63.6	52.2	34.5	33.2	49.1	42.7
Toledo	2.12	2.81	31.89	30.04	57.9	48.5	39.0	31.8	48.5	40.1
Wooster	3.12	2.93	26.73	33.57	58.8	49.3	36.6	31.8	47.7	40.5
Youngstown	3.14	3.11	27.37	34.39	57.3	48.4	38.1	33.6	47.7	41.0

Temperatures in degrees F, Precipitation in inches

Record Highs set: 24th -Toledo 67, Youngstown 65

Record High tied: 24th - Mansfield 63

Table Created by Ted W. Gastier, OSU Extension from National Weather Service, OARDC & Local Data

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information that is complete, timely, and accurate, the pesticide user bears responsibility of consulting the pesticide label and adhering to those directions.

Keith L. Smith, Associate Vice President for Ag. Adm. and Director, OSU Extension.

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