# Crop Profile: Poultry in New York

## I. Profile Prepared by:

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## II. Basic Commodity Information

**State Rank:** ................................ Chickens (excluding broilers): 18
.................................................... Egg Production: 21
**% U.S. Production:** .................... Layers – 1.37%; Broilers **--** 0.09%; Turkeys – 0.007%
**Broiler Production**: .................... 9.9 million pounds
**Value of Broiler Production**:...... $4.1 million
**Egg Production**: ......................... 986 million eggs
**Value of Egg Production**:........... $50.9 million
**Turkey Production:**.................... 12 million pounds
**Value of Turkey Production:** ..... $4.8 million
**Value of Other Chickens Sold:** .. $280 thousand
**Combined Cash Value of eggs, broilers, and turkeys, plus sales of other chickens:**.......... $60.1 million
**Yearly Production Costs:**........... For eggs – $15.60/bird/year
**Production Regions:** Statewide
**Production Methods**: The New York poultry industry produces approximately $86 million worth of processed poultry products that are sold in New York and around the world. Although small in comparison to some southeastern broiler states that produce over a billion dollars in processed poultry products and small in comparison to the New York dairy industry, the New York poultry industry makes a significant contribution to the total agribusiness production of the state equal in size to that of the cabbage and onion industries combined. In addition, New York produces two products that are internationally recognized — the ISA-Babcock laying hen and the Long Island duck.

The largest portion of the New York poultry industry is the egg industry with 86% of poultry revenue. Over 986 million eggs are produced by poultry farms in the state, enough to provide every citizen in the state with 50 eggs. The value of those cartoned and delivered eggs in 1998 was $51 million. These revenues traditionally have been divided among a diverse group of farmers as shown in the agricultural census of 1997:

| Number of Farms | Number of Chickens |
|---|---|
| 319 | 50 to 3,199 |
| 31 | 3,200 to 100,000 |
| 10 | More than 100,000 |

Although New York is not a major poultry meat production state, there are broilers and turkeys being grown and processed in New York for niche markets. About 8 million, high value Kosher broilers are processed in the state, of which 25% are grown in New York. In addition, another million broilers are grown to be sold live to processors in Canada and a few hundred thousand are sold live in New York City. There are also 12 million pounds of turkey grown and processed in New York. The turkey and broiler meat grown and processed in the state are worth more than $8.9 million.

Responses from the last industry survey undertaken in 1998 indicated that "Over half (68%) of the producers felt that flies were one of the most important pests affecting the industry, followed by lesser mealworm and other destructive beetles (40%), and northern fowl mites (21%)." Most felt that flies were one of the most difficult pests to control as well.

Many poultry producers feel they are losing the war against flies in their houses due to pesticide resistance. Over time, the percentage of resistant flies has increased and the insecticide that was once effective now provides only partial control for a short time. Resistance to chemicals spreads rapidly among farms by fly migration. This has been demonstrated using the insecticide permethrin (Ectiban, Atroban). When it was first introduced, permethrin controlled flies for 4-8 weeks. Now control only lasts a few days. Resistance problems are further compounded by the fact that dairy farms and other animal production facilities use many of the same insecticides that poultry producers use. Pesticides that were available and effective to poultry and livestock producers six years ago (when the last pesticide impact assessment survey was undertaken) have become ineffective due to resistance or have been removed from the marketplace.

In the absence of the above mentioned products and techniques, it is essential to determine what control measures (chemical, cultural, and biological) are being utilized to combat pests of the poultry industry. In addition, it is important to determine the efficacy of current pest control practices as well as the economic results brought about due to the changes in pest control strategies.

In the future, pesticides will undoubtedly continue to play a major role in pest management programs, but their true impact and significance must be broadly examined. Metcalf (1980) has reviewed the changing role of insecticides in agriculture. Croft and Brown (1975) examined the impact of insecticides on natural enemies of insects and mites. Turpin and Maxwell (1976) reported on pesticide use surveys conducted among Indiana growers. Pesticide use surveys are available for New York (Roberts, 1981; Stark and Ackerman, 1988; Partridge et al., 1992; Harrington et al., 1998) and the northeast (Specker et al., 1986; USDA, 1978).

Current pest management techniques rely heavily on pesticides. Today, pesticides and their cost of application are a significant production expense for producers. Over 7 million pounds of pesticides (herbicides, insecticides, and fungicides) are annually applied in New York agricultural production systems. If pesticides are used as a single tactic, this approach, although often effective, can have serious drawbacks including the development of pesticide resistance and destruction of natural enemies of these pests. The data generated from use surveys allows researchers and others to evaluate and assess the use/need of agricultural chemicals in the poultry industry.

A systems approach to pest management utilizing optimal integrated pest management practices [chemical (least toxic), cultural and biological] and best production practices would greatly benefit the poultry industry in New York State. Although such a system continues to be developed at Cornell University by the Veterinary Entomology Program in colaboration with the NYS Integrated Pest Management Program, additional information on the use and effectiveness of current control practices is necessary to aid in the assessment, evaluation and planning of this effort.

In 1998, Cornell undertook a survey of NYS poultry producers. New York State poultry producers for the most part housed their flocks in high-rise caged-layer houses with concrete floors. The tractor was the primary method of manure removal from poultry facilities. Manure removal was done semi-annually or annually. This practice has not changed much from the 1992 survey (Partridge, et al, 1993) of NYS poultry producers.

Rodents were indicated as the pest causing greatest economic loss to poultry operations in NYS, followed by flies and lesser mealworm/hide beetles. Poultry producers felt that both flies and rodents were the most difficult pests to control with currently registered active ingredients. Presence of pest and personal discomfort were the main criteria for determining when to use pesticides in their poultry facilities. The majority of survey respondents reported that past success with a product, Cooperative Extension, and chemical salesperson recommendations were their primary criteria for determining which pesticides to use against pests. Interestingly, Cooperative Extension was utilized much more than indicated in the 1992 survey (33.33% versus 9.4%, respectively).

A small group of respondents used herbicides for weed control around their poultry facilities. Products that contained glyphosate, dicamba, and paraquat were used. In addition, rodenticides were used by the majority of respondents. Products that contained bromadiolone, brodifacoum, and difethialone were used most often. The percentage of users for both herbicides and rodenticides remained similar to the 1992 survey.

Residual sprays, space sprays and baits were most commonly used for fly control in and around poultry houses. Products that contained permethrin, cyfluthrin or methomyl were used against flies by a significant portion of respondents. Most producers did not use feed-through larvicides or manure treatments.

Ninety-three percent of New York poultry producers indicated that they were using manure management as an alternative to pesticides. Use of beneficial insects accounted for 41% of respondents. As indicated in the results, this percentage of use has doubled from the 1992 survey. According to Scott et al. (2000), the house fly has developed very high levels of resistance to the insecticides available (registered) for its control. Therefore, poultry producers are in need of alternative methods for improved pest suppression. Fly control in poultry facilities using a combination of parasitoid releases, manure management and avoidance of insecticides that are harmful to the parasitoids has been shown to give excellent control (Axtell, 1970).

During 1998, an equal amount of New York poultry producers spent between $300 and $499, as well as between $1000 and $1999 annually for fly control. A majority also spent between $10 and $49 on herbicides and over $700.00 on rodenticides. Chemical fly control and rodent control costs have increased substantially since the 1992 survey. Herbicide use and costs have remained the same.

Most poultry producers are disposing of empty containers properly. Also, unused pesticides are being stored for the following season. The most popular place for storage of unused pesticides is still in an area within the poultry house.

## III. Pest Information: Insects

### 1. House Flies (*Musca domestica*)

**Type of Pest:** Insect

**Frequency of Occurrence:** Yearlong in caged-layer houses

**Damage Caused:** The house fly is the major pest species associated with poultry manure, especially in caged-layer operations. Suitable fly-breeding conditions are present year round in deep-pit houses because of long-term manure accumulation and controlled temperatures. Even though flies appear to have no direct effect on production, they are a concern to poultry producers because they can cause public health problems resulting in poor community relations and possible legal action. The effective house fly dispersal range appears to be 1/2 to 2 miles, but distances as great as 10 to 20 miles have been reported.

House flies can transmit more than 100 human and animal disease-causing organisms, including protozoa, bacteria, viruses, rickettsia, fungi, and worms. House flies are considered intermediate hosts for tapeworms and may transmit ascarids to caged birds. Flies mechanically carry ascarid and other nematode eggs on their feet from manure to pens, feed, and water. Fly maggots ingest tapeworm and ascarid eggs from the poultry manure and retain them in the gut until maturity. In turn, infected flies are ingested by the feeding bird. Although it appears that avian influenza is spread principally by contaminated shoes, clothes, and equipment, the virus has been isolated from adult house flies.

**% Birds Affected:** All caged-layers. Not a problem in shallow pit houses.

**Pest Life Cycles:** House flies are nonbiting flies about 1/4 inch long, mostly dull gray in color, with four black stripes on the thorax. Mouthparts are sponge-like and are used for ingesting liquid foods. House flies breed in manure, spilled feeds, and other moist, warm, decaying organic material. Each female can produce up to six batches of 75 to 200 eggs at 3 to 4 day intervals, laying the eggs in cracks and crevices under the surface of the breeding material. Larvae (maggots) hatch from the eggs in 12 to 24 hours. They are white and cylindrical, tapering anteriorly. Maggots complete their development in 4 to 7 days, passing through three growth stages, or instars, as they increase in size. Mature larvae form a dark reddish-brown hardened case, called a puparium, from the larval skin and then pupate. The pupal stage usually lasts 3 to 4 days, and an adult fly emerges to complete the cycle. Generations overlap; all stages are present at the same time. The life cycle is temperature dependent, requiring 10 days at 85°F, 21 days at 70°F, and 45 days at 60°F.

Adult flies live an average of 3 to 4 weeks, but they can live twice this long. They are most active during the day at temperatures of 80° to 90°F and become inactive at night and at temperatures below 45°F. Resting adults can be seen on ceilings, walls, posts, other surfaces inside a poultry house, surfaces outside a house, beneath roof overhangs, on walls, fences, and vegetation. Preferred resting places can be detected by the accumulation of "fly specks," light-colored spots formed from regurgitated fluid and darker fecal spots.

**Timing of Control:** Dependant upon population density (fly); spot card numbers >100/card

**Yield Losses:** Unknown

**Regional Differences:** None

**Other Issues:** Primary damage caused by fly migration to residential neighbors. Secondary damage is potential disease transmission. High incidence of insecticide resistance.

## 2. Little House Fly (*Fannia caniculars*)

**Type of Pest:** Insect

**Frequency of Occurrence:** Spring/Fall

**Damage Caused: :** High populations of the little house fly may occur on poultry farms and become the predominant fly pest in some areas. The little house fly resembles the house fly but is smaller (about 3/16 inch) and has three brown stripes on the thorax. This fly is normally associated with litter-type floor housing and open window ventilation. Like the house fly, the little house fly may invade homes in nearby residential areas, but it tends to be less annoying since it does not settle as readily on food or people. Both sexes can be found resting on weeds, branches, or sides of buildings.

Adult males show a distinctive aimless hovering or circling flight behavior of long duration within the poultry house or in outside shaded areas. Female flies are less active and more often found near breeding sites. Since this fly is less tolerant of hot, midsummer temperatures than the house fly, it often emerges in large numbers in early spring, declines in midsummer, and may peak again in late fall.

**% Birds Affected:** <10%; doesn't occur regularly in NY

**Pest Life Cycles:** The little house fly life cycle is similar to that of the house fly. Eggs are deposited on decaying organic material, especially excrement from poultry, cattle, and humans. Larvae hatch from the eggs in 36 to 48 hours. Unlike house fly larvae, the little house fly larvae are brown, flattened, and spiny. Larvae require eight days or more for development, depending upon the temperature and manure conditions. Pupae resemble the larvae in appearance and last about eight days. The egg-to-adult life cycle typically ranges from 18 to 22 days but may be longer depending upon temperature.

**Timing of Control**: Density dependant

**Yield Losses:** Best estimate is zero

**Regional Differences:** None

**Other Issues:** None

## 3. Black Garbage Fly (*Hydrotaea aenescens*)

**Type of Pest:** Insect

**Frequency of Occurrence:** Summer

**Damage Caused:** While black garbage fly larvae have been known to exterminate house fly populations, they cannot generally be considered beneficial because of their large numbers on the farm and their ability to disperse as adults into nearby communities. Two other species of black garbage flies, H. *leucostoma,* a widely distributed species, and H. *capensis,* may also be found on poultry farms in the Northeast.

**% Birds Affected:** <10%

**Pest Life Cycles:** Black garbage flies, found in large numbers around poultry facilities, are shiny bronze-black flies, a little smaller than house flies. The life cycle is similar to that of the house fly and ranges in duration from 14 to 45 days. Black garbage fly larvae, which closely resemble house fly larvae, hatch from the egg in 12 to 16 hours. Larvae develop in a minimum of five days and may prey on other fly larvae. The pupal stage requires at least four days. Adults live an average of 14 to 20 days. Although no overwintering stage is capable of withstanding freezing temperatures, all stages are found throughout the year under suitable conditions.

Unlike the house fly and little house fly, black garbage flies tend to stay on their food source at night rather than rest on the ceiling or on outdoor vegetation. Female flies seem to have limited flight activity, yet they have been reported up to four miles from their breeding areas.

**Timing of Control:** Density dependant
**Yield Losses:** Best estimate is zero
**Regional Differences:** None
**Other Issues:** Only occurs in wet manure.

### 4. Small Dung Fly (*Sphaerocerids*)

**Type of Pest:** Insect
**Frequency of Occurrence:** Year-round
**Damage Caused:** None
**% Birds Affected:** All farms are infested
**Pest Life Cycles:** Small dung flies are very small, blackish or brownish flies that breed in manure and other decaying materials. They often occur in large numbers in poultry manure, but generally do not pose a nuisance on the farm or in nearby communities. Sphaerocerids are among the first arrivals at new manure. Adult sphaerocerids forage over a broad range of manure moisture content, but they predominate at the peak of the manure cone where moisture content is higher. Larval development occurs where moisture exceeds 50 percent. Control efforts are discouraged because sphaerocerids are generally not pests and may be used as an alternative food source by beneficial hister beetles.
**Timing of Control:** No control needed
**Yield Losses:** None
**Regional Differences:** None
**Other Issues:** None

## Control Practices for Flies (House Flies, Little House Fly, Black Garbage Fly, and Small Dung Fly)

**Cultural Control:** The keys to cultural control are moisture management, sanitation, and manure removal. The manure moisture level is the most important factor in fly control. Moist poultry manure is highly attractive to adult flies and provides ideal conditions for fly development. Fresh poultry manure is approximately 75 to 80 percent moisture, and flies can breed in manure with a moisture content of 50 to 85 percent. Moisture levels are affected by leaking waterers, improper ventilation, and seepage from the exterior. Leaking waterers are the major source of wet manure conditions, so waterers should be inspected daily.

If dry conditions are maintained, manure will form a cone-shaped mound as it accumulates and only fresh additions at the manure cone peak will be suitable for fly breeding. Houses with scraper boards usually have drier manure accumulations than those without, but scraper boards are not effective if there are water leaks.

Ventilation (airflow) reduces manure moisture while also maintaining desirable air temperatures, removing gases such as ammonia, and providing fresh air. Exhaust fans located in the manure pit walls provide ventilation for environmentally controlled high-rise houses. With adequate insulation, proper temperatures (60° to 75°F) can be maintained in cold weather. Fresh air is brought in from ceiling inlets and is circulated through the chickens and over the manure in the pit. Fans placed on both sides of the pit can help reduce moisture.

Sound sanitation practices are also important in fly control. Dead birds should be removed daily and disposed of properly. Spilled feed and broken eggs remaining on the manure will attract adult flies. Mowing grass and weeds adjacent to the poultry house eliminates resting areas for adult flies and allows full airflow through the fans.

Manure removal is often used as a fly control tactic, but the fly life cycle must be broken for control efforts to be effective. Proper manure management reduces fly buildup and maximizes the development of beneficial predator and parasitoid populations. Fresh manure that accumulates within two days after house clean-out is ideal for fly breeding. A severe fly outbreak often occurs in 2 to 3 weeks after a clean-out during the fly season. If possible, remove manure in cooler months when flies are less active. Beneficial arthropods can be conserved and their populations maximized by allowing manure to accumulate for long periods.

**Biological Control:** Proper cultural practices encourage poultry manure accumulations containing large populations of beneficial predators and parasitoids that can suppress house fly populations. In the Northeast, macrochelid mites and hister beetles are the major predators in caged-layer operations. Parasitoid populations, of major importance in the southern United States, are present at lower densities than the two predators. Less is known about the role of parasitoids in suppressing fly populations in poultry houses in the North.

The macrochelid mite, <u>Macrocheles muscaedomesticae</u>, is the most common mite in poultry manure. The reddish brown mite, slightly less than 1/16 inch in size, feeds on house fly eggs and first-instar larvae. It can consume up to 20 house fly eggs per day. Mites are found on the outermost layer of the manure, particularly its peak. Macrochelids can cause substantial reductions in house fly numbers, but large mite populations are required for any appreciable impact. Efforts, therefore, should be made to conserve natural populations present in the manure. About 3 to 4 weeks of manure accumulation is necessary for mites to become established.

Another mite that may be found in poultry manure is the uropodid mite, Fuscuropoda vegetans. It feeds only on first-instar house fly larvae deeper in the manure, complementing the egg-feeding activity of the macrochelid mite on the manure surface.

The principal hister beetle in northeastern poultry houses is Carcinops pumilio, a small black beetle approximately 1/8 inch long. It feeds on house fly eggs and first-instar larvae. Its potential as a predator appears similar to that of the macrochelid mite. Adult and immature hister beetles live in the surface layers of manure and forage for fly and mite prey. Like macrochelid mites, hister beetles do not seem attracted to fresh manure, and it may take six weeks for significant populations to develop. Another hister beetle, Gnathoncus nanus, is also present at lower numbers on poultry farms in the Northeast.

Tiny, stingless parasitoids attack most of the common manure-breeding flies. Parasitoids are rarely noticed because they are extremely small (1/16 to 1/8 inch) and occur naturally in low numbers on many farms. They live in manure or other decaying organic matter and search for fly pupae. Adult female parasitoids lay an egg on the fly pupa within the puparium. Here the developing parasitoid larva consumes the pupa and emerges as an adult parasitoid.

Because of naturally low parasitism levels, control programs have been based on mass releases of commercially-reared parasitoids. Some parasitoids are available from commercial insectaries. For a release program to be successful, the producer needs to consider which species and strains, and in what numbers, to release. Parasitoid strains must be climatically adapted to the planned release area. Parasitoids currently offered by some commercial insectaries are generally not climatically adapted to the Northeast. In addition, insectaries have problems maintaining pure cultures. Most producers should concentrate on conserving and building their native predator and parasitoid populations by using proper management techniques and by minimizing insecticide use.

**Chemical Control:** Producers must monitor fly populations on a regular basis in order to evaluate their fly management program and to decide when insecticide applications are required. Accurate records should be kept on pesticides and on dosage rates used. Insecticides can play an important role in integrated fly management programs. However, improper timing and indiscriminate insecticide use, combined with poor manure management, poor moisture control, and poor sanitation practices, will increase fly populations and the need for additional insecticide applications. While most fly insecticides are toxic to predators and parasitoids and indiscriminant use can result in their destruction, selective application of insecticides can avoid killing predators and parasitoids.

Insecticide applications may be classified by targeted fly stage (adulticides and larvicides) or method of application (sprays, baits, and feed additives).

Space sprays containing synergized pyrethrins or a combination of dichlorvos and synergized pyrethrins provide a quick knockdown of adult flies in an enclosed air space. Because space sprays have very little residual activity, resistance to these insecticides is still relatively low among fly populations in the Northeast. Unfortunately, however, resistance has become a rather severe problem in poultry operations where pyrethrins are applied with automated dispensing systems. Poultry producers are experiencing loss of effective fly control with these automated dispensing systems in only one fly season. They report that at the beginning of the fly season, a single weekly application is effective, but at the end of the fly season, even twice-daily applications are ineffective. The key to successful fly management with these systems is that they be used sparingly — no more than once every 3 to 4 days.

Baits are excellent selective adulticides for suppressing low fly populations and maintaining them at a low level. Baits are also especially effective when combined with space sprays. Baits are placed upstairs in a high-rise house, since scattering bait in the pit will destroy parasitoid and predator populations. Baits should be applied/placed so that they will not be accidentally eaten by birds or mixed into their feed.

Using feed additives to make manure toxic to fly larvae is an attractive method of fly control because it is easy to do. Only one material, cyromazine, an insect growth regulator, is currently registered for use in laying hens. While cyromazine is effective and does not affect predators and parasitoids, it can be expensive to use and has led to resistance in flies. In a recent study in New York, fly resistance to cyromazine was found to be widespread in poultry operations with a history of cyromazine use. Therefore, cyromazine should not be used as a replacement for other insecticides or for proper management practices.

Larvicides (pesticides applied directly to the manure surface to kill maggots) are not recommended since they will destroy the predators and parasitoids associated with the manure. Larvicide applications to an entire house will give only short-term fly control and will kill natural biological control agents that are present. Treatments will then need to be repeated. Because of poor penetration of the manure, the insecticide kills a small proportion of maggots. Adding moisture to the manure also makes it more suitable for fly breeding. However, spot treatments of small areas with high numbers of maggots can be effective and yet have a minimal effect on the overall biological control agent population.

Treatment of building surfaces with residual sprays such as permethrin, dimethoate, and rabon has been a very popular fly control strategy over the years. Unfortunately, however, high levels of fly resistance to these insecticides are now very common. These materials are used sparingly and only as a last resort to control fly outbreaks that cannot be managed with other techniques.

**Space sprays**
permethrin
synergized pyrethins
synergized pyrethins + dichlorvos
synergized pyrethins + permethrin

**Residual premise**
cyfluthrin
deltamethrin
dichlorvos
dimethoate
malathion
permethrin
resmethrin
synergized pyrethins + chlorpyrifos
tetrachlorvinphos

**Bait**
boric acid
methomyl

**Larvicide -- manure treatment**
cyromazine
dichlorvos
dimethoate (when birds are not in building)
malathion
tetrachlorvinphos

**Larvicide -- feed additive**
cyromazine

## 5. Lesser Mealworm (*Alphitobius diaperinus*)

**Type of Pest:** Insect
**Frequency of Occurrence:** The lesser mealworm, or darkling beetle, a pest of stored grain products, isone of two species of beetles associated with poultry manure and litter accumulations in the Northeast. Adults and larvae of this species can become extremely abundant in poultry manure and litter.
**Damage Caused:** This beetle can cause extensive damage as the mature larvae bore into structural materials, apparently seeking a safe pupation site. The lesser mealworm is also a vector (transmitter) and serves as a reservoir for several poultry disease pathogens such as acute leukosis (Marck's disease), fowl pox, numerous pathogenic *Escherichia coli* serotypes, several *Salmonella* species, and tapeworms. Large beetle populations may become a public nuisance at clean-out time because of adult migration from the fields where the manure is spread into nearby residential areas.
**% Birds Affected:** 100%
**Pest Life Cycles:** Adult lesser mealworms are dark brown or black in color and about 1/4 inch long. The wireworm-like larvae are yellowish brown, up to 3/4 inch long. Lesser mealworms spend most of their time in the manure or litter. Adults feed on damp and moldy grain and are especially abundant in areas with spilled grain and high moisture.

The life cycle is temperature dependent. There is a marked reduction in egg hatch below 70°F, and development time from egg to adult increases with decreasing temperature. Development requires 42 days at 100°F, 58 days at 80°F, and 97 days at 60°F. Eggs are laid in cracks and crevices in the manure or litter and hatch in 3 to 6 days. Most larvae develop through five to nine instars, the number increasing with lower temperatures. The last larval instar pupates in drier areas of the manure or litter, in cracks and crevices or in building insulation. Small round holes about 1/4 inch in diameter are the first signs of damage. The pupal stage lasts 3 to 10 days. Adults live three months to a year.
**Timing of Control:** Suggested if adult beetle presence is >50/sq. ft.
**Yield Losses:** None
**Regional Differences:** None
**Cultural Control Practices:** Tarp manure, flashing
**Biological Control Practices**: *Beauvaria. bassiana*
**Other Issues:** Migration to residential neighbors following manure application to fields, structural damage
**Chemical Controls for lesser mealworm:** Once a poultry house becomes infested, control is difficult since beetles migrate throughout the house and pupation occurs in wood and insulation. A thorough house cleaning, combined with insecticide treatment when the birds are removed, will usually suppress the population for a short time.Migration may be reduced by applying insecticide sprays to the pit walls and posts. Applying dusts and sprays to manure and litter is fairly effective, but it can destroy any fly biological control agents present. Attaching well-sealed, angled, metal flashing to pit walls at the masonry-frame wall joints and to posts can help reduce beetle migration out of the pit. However, the rapid accumulation of dust and debris may make the flashing ineffective. Even if the flashing is effective, beetle dispersal into the community at clean-out time is a potential problem.

## 6. Hide Beetle (*Dermestes maculatus*)

**Type of Pest:** Insect
**Frequency of Occurrence:** The hide beetle long recognized as a pest of hides, skins, and furs is one of two species of beetles associated with poultry manure and litter accumulations in the Northeast. Adults and larvae of this species can become extremely abundant in poultry manure and litter.
**Damage Caused:** These beetles can cause extensive damage as the mature larvae bore into structural materials, apparently seeking a safe pupation site. Large beetle populations may become a public nuisance at clean-out time because of adult migration from the fields where the manure is spread into nearby residential areas.
**% Birds Affected:** 75%

**Pest Life Cycles:** Hide beetles are larger than darkling beetles, about 1/3 inch long, and dark brown on the top with a mostly white undersurface. Hide beetle larvae are similarly colored, thickly covered with long brown hairs, and grow to about 1/2 inch long. Scavenging hide beetles feed on carcasses, skins, hides, feathers, dead insects, and other animal and plant products. Broken eggs and dead birds in the manure encourage beetle infestations, although large beetle populations may develop even with good sanitation.

Eggs are laid on manure and litter surfaces. The hide beetle life cycle does not seem to be as temperature-sensitive as that of the lesser mealworm. Larvae hatch from eggs in 2 to 7 days, depending upon the temperature and relative humidity, and pass through an average of seven instars in 23 to 41 days or more. Larvae normally remain in the manure, but large numbers will migrate from the pit to find a safer pupation site or to move away from unfavorable changes in the manure. Larvae bore into wood posts, beams, paneling, dry wall, and insulation to create a protected pupation chamber. Adults are rarely involved in boring. Adults emerge in 6 to 15 days and live 60 to 90 days.

**Timing of Control:** Beetle presence

**Yield Losses:** Best estimate is zero

**Regional Differences:** None

**Cultural Control Practices:** Tarp manure (manure is removed from the poultry facility and piled outside, tarped with clear or black plastic and left to absorb sun until it heats up enough to kill the hide beetle eggs, larvae and adults).

**Biological Control Practices:** None

**Other Issues:** None

**Chemical Controls for hide beetle:** Once a poultry house becomes infested, control is difficult since beetles migrate throughout the house and pupation occurs in wood and insulation. A thorough house cleaning, combined with an insecticide treatment when the birds are removed, will usually suppress the population for a short time. Migration may be reduced by applying insecticide sprays to the pit walls and posts.

Applying dusts and sprays to manure and litter is fairly effective, but it can destroy any fly biological control agents present. Attaching well-sealed, angled, metal flashing to pit walls at the masonry-frame wall joints and to posts can help reduce beetle migration out of the pit. However, the rapid accumulation of dust and debris may make the flashing ineffective. Even if the flashing is effective, beetle dispersal into the community at clean-out time is a potential problem.

| **Residual premise** | **Manure/litter treatment** | **Bait** |
|---|---|---|
| carbaryl | carbaryl | boric acid |
| cyfluthrin | tetrachlorvinphos | carbaryl |
| tetrachlorvinphos | | |

## 7. Northern Fowl Mite (*Ornithonyssus sylviarum*)

**Type of Pest:** Mite

**Frequency of Occurrence:** Mostly on birds 17-40 weeks old, but may occur on younger birds

**Damage Caused:** Mites congregate first on the vent, then the tail, back, and legs of female birds, but they are more scattered on male birds. As the mite population increases, feathers become soiled from mite eggs, cast skins, dried blood, and excrement. The soiling produces the characteristic blackened feathers in the vent area. Scabs may also form in the vent area. While death due to actual anemia is rare, birds with heavy infestations (50,000 mites/bird) can lose six percent of their blood daily.

Mite populations can rise rapidly after a bird has been first infested, especially during the cooler months and on young birds 20 to 30 weeks of age. Newly infested birds may support mite populations in excess of 20,000 per bird in 9 to 10 weeks. Mites do not become established on birds in large numbers until birds reach sexual maturity. Birds older than 40 weeks usually do not support many mites.

**% Birds Affected:** 15-25%

**Pest Life Cycles:** The northern fowl mite completes its entire life cycle on the bird, although it can survive off the host for 2 or 3 weeks under suitable conditions. Life cycle stages consist of egg, larva, two nymphal stages, and adult. The eight-legged adult is only 1/26 of an inch long and is usually dark red to black. Females lay two to five eggs in the fluff of feathers after each blood meal. Eggs hatch into six-legged larvae within two days. All other mite stages possess eight legs. Nonfeeding larvae develop in approximately nine hours and molt into blood-feeding nymphs that develop in 1 or 2 days. Second stage nymphs, like the larvae, do not feed and molt to adults in less than a day. The entire life cycle can be completed within a week under favorable conditions.

**Timing of Control:** Control of northern fowl mites in caged-layer operations is based on efforts to prevent infestation and to apply an acaricide when an infestation occurs. Regularly monitoring flocks for the presence of mites will allow them to be detected while the population is low or isolated to a few birds.

A house should be clean and mite-free before new birds are moved in, and the new flock should be mite-free. Once the flock is in the house, care should be taken to prevent contamination from the clothing of workers and various equipment, since mites can live for a few weeks off the host. Mites have been shown to be readily transferred from an infested house to an uninfested house by contaminated egg flats. Wild birds and rodents can harbor and disseminate northern fowl mites as well.

The detection of an initial low-mite population that can be controlled effectively and economically is important in a mite-monitoring program. With early detection, only part of a caged-layer house may need to be treated. At least 10 randomly selected birds from each cage row in the entire house should be monitored weekly. The vent area should be examined under a bright light, and the feathers parted to reveal the mites. Single caged birds often have more mites than those caged in groups and, because of variation in susceptibility among birds, one bird may have mites while its cage mates are mite-free.

The following index is effective for estimating infestation levels: 0 = no mites observed, 1 = 1 to 2 mites, 2 = 3 to 9 mites, 3 = 10 to 31 mites, 4 = 32 to 99 mites, 5 = 100 to 300 mites, 6 = 301 to 999 mites, 7 = 1,000 to 3,000 mites, 8 = 3,001 to 9,999 mites, 9 = 10,000 to 32,000 mites, and 10 = more than 32,000 mites. An average index of 5 or greater for all examined birds generally indicates the need for chemical treatment.

The actual decision to treat is influenced by flock age, time of year, and distribution of the infestation in the house. It is usually not economical to treat older birds because their mite populations are unlikely to increase. A population buildup is more likely in a young flock. Mite populations can be expected to increase in cooler months and decrease in warmer months. An infestation restricted to one part of the house may not spread, but the infested area should be closely monitored. Detection of mites in broiler-breeder operations generally means the entire flock must be treated.

**Yield Losses:** unknown
**Regional Differences:** None
**Cultural Control Practices:** Mite-free bird source
**Biological Control Practices:** None
**Other Issues:** Potential resistance to control
**Chemical Controls for Northern fowl mite:** Chemical control of northern fowl mites in caged-layer operations requires direct pesticide application to the vent region with sufficient pressure (minimum 100 to 125 psi) to penetrate the feathers. The spray will have to be directed upward from beneath the cages to reach the vent. A split treatment of a recommended active ingredient may increase effectiveness since water is held better when applied to wet feathers. Mix half the insecticide in the standard amount of water for the first application, spray and then mix the other half in another standard amount of water for the second application. Dust formulations can be purchased ready-to-use and may be applied to caged-layers with a power blower. Treatment is difficult in broiler-breeder operations where birds are not confined to cages.

**Sprays**
carbaryl-Sevin
malathion
permethrin-Atroban, Ectiban
tetrachlorvinphos-Rabon

**Dusts**
carbaryl-Sevin
permethrin-Ectiban D
tetrachlorvinphos-Rabon

## IV. Pest Information: Vertebrates

**Type of Pest:** Rodents
**Frequency of Occurrence:** Year-round
**Damage Caused:** Rat and mouse infestations generally result in sanitation problems, loss or cantamination of food, possible disease transmission, and/or structural damage to buildings, insulation, or wiring. Rats will also kill poultry.
**% Birds Affected:** 100%
**Pest Life Cycles:** In general, rodents have three basic requirements: food, water, and harborage (places to hide and nest). If one or more of these items is missing from the area, rodent populations will remain low. Unfortunately, all three are usually abundant in and around poultry houses. An adult rat eats about 1 to 2 ounces of food each day, whereas a mouse will eat far less, about 0.1 ounce per day. Individually, this is not a lot of feed, but a large population can account for several tons of food each year.

Although both rats and mice need water to survive, mice are often able to get what little moisture they need from the food they eat. This ability allows them to nest and feed in locations where water is not abundant. Rats are not so adaptable. They cannot extract enough moisture from their food and must be relatively close to a source of water.

Rats and mice are both burrowing animals, but mice also build nests above ground in hidden, secluded areas such as walls and ceilings. Rats, on the other hand, generally nest almost exclusively underground and come out only to find food or water. The reproductive capacity of rats and mice is quite high. Both breed throughout the year, producing 4 to 8 litters annually. Rats are sexually mature at 3 to 5 months of age and have 6 to 12 young per litter. Mice reproduce when younger (1 to 2 months) and deliver 5 to 6 young per litter. Based on reproductive potential alone, a single pair of rats could produce 1,500 offspring in a single year. Fortunately, other factors such as predation, food availability, and population density limit reproduction and survival in nature. Even so, rat and mouse numbers can rise quickly if ignored.

**Timing of Control:** Pest presence
**Yield Losses:** Economic losses due to rodents are probably astronomical, but accurate information on their total damage and the cost of controlling their depredation is not available.
**Regional Differences:** None
**Cultural Control Practices:** Sanitation, mowing around facilities, rodent-proof construction, and rodent-proof storage of feeds
**Biological Control Practices:** None
**Other Issues:**
**Chemical Controls for Rodents:**

The following table is a summary of rodenticides and total amount used by those NY poultry producers surveyed by the Pesticide Management Education Program at Cornell University in 1999.

| Product | Active Ingredient | EPA Reg. No. | # of Records | Total Amt. Prod. | Total Amt. a.i. |
|---|---|---|---|---|---|
| Boot Hill Mini Blocks | bromadiolone | 7173-202 | 1 | 400 lbs. | .02000 lbs. |
| Boot Hill Paraffinized Pellets | bromadiolone | 7173-187 | 1 | 5 lbs. | .00025 lbs. |
| Boot Hill Poultry House Bait | bromadiolone | 7173-171 | 2 | 220 lbs. | .01100 lbs. |
| Clout All-Weather Bait | bromethalin | 67517-66 | 1 | 1 lb. | .00010 lbs. |
| Contrac All-Weather Blox | bromadiolone | 12455-79 | 5 | 955 lbs. | .04775 lbs. |
| Contrac Rodenticide Place Pac | bromadiolone | 12455-86 | 1 | 600 packs | .00281 lbs. |
| D-Cease | difethialone | 7173-211 | 1 | 26.48 oz. | .00004 lbs. |
| d-Con RTU Bait Trays | brodifacoum | 3282-66 | 2 | 120 oz. | .00038 lbs. |
| Eaton's All-Weather Bait Blocks | diphacinone | 56-42 | 1 | * | * |
| Enforcer Rat & Mouse Killer | chlorophacinone | 7173-128 | 1 | 2 lbs. | .00010 lbs. |
| Final Blox | brodifacoum | 12455-89 | 1 | 144 lbs. | .00720 lbs. |
| Final Rodenticide | brodifacoum | 12455-90 | 1 | 50 lbs. | .00250 lbs. |
| Final RTU Place Pac | brodifacoum | 12455-91 | 1 | 186 lbs. | .00930 lbs. |
| Generation Mini-Blocks | difethialone | 7173-218 | 3 | 322.5 lbs. | .00806 lbs. |
| Havoc Rodenticide Bait Pack | brodifacoum | 10182-340 | 4 | 31.72 lbs. | .00159 lbs. |
| Hawk Bait Chunx | bromadiolone | 12455-79 | 2 | 163 lbs. | .00815 lbs. |
| Hawk Rodenticide | bromadiolone | 12455-69 | 1 | 500 lbs. | .02500 lbs. |
| Hawk RTU Place Pac | bromadiolone | 12455-76 | 2 | 163 packs | .00076 lbs. |
| Hombre RTU Pellet Placepacks | difethialone | 7173-206 | 1 | 140 lbs. | .00350 lbs. |
| Hombre RTU Pellets | difethialone | 7173-205 | 1 | 20 lbs. | .00050 lbs. |
| Jaguar Bait Chunx | brodifacoum | 12455-89 | 1 | 180 lbs. | .00900 lbs. |
| Jaguar RTU Place Pac | brodifacoum | 12455-91 | 1 | 1 pack | .000003 lbs. |
| Just-One-Bite Bait Pack | bromadiolone | 7173-188 | 1 | * | * |
| Just-One-Bite Loose Pellets | bromadiolone | 7173-187 | 1 | 5 lbs. | .00025 lbs. |
| Liqua-Tox II | diphacinone | 12455-61 | 1 | 1 gal. | .00045 lbs. |
| Maki Paraffinized Pellets | bromadiolone | 7173-187 | 1 | * | * |
| Maki Rat & Mouse Meal Bait | bromadiolone | 7173-186 | 2 | 450 lbs. | .02250 lbs. |
| Maki Rat and Mouse Bait Pack | bromadiolone | 7173-188 | 2 | 18.75 lbs. | .00094 lbs. |
| Quintox | cholecalciferol | 12455-39 | 2 | 152 lbs. | .11400 lbs. |
| Rampage RTU Place Pac | cholecalciferol | 3240-42 | 1 | 8.472 oz. | .00040 lbs. |
| Rozol Blue Tracking Powder | chlorophacinone | 7173-172 | 1 | 4 oz. | .00050 lbs. |
| Talon-G Rodenticide Pellets | brodifacoum | 10182-336 | 1 | 45 lbs. | .00225 lbs. |
| TomCat All-Weather Bait Chunx | diphacinone | 12455-81 | 1 | 8 lbs. | .00040 lbs. |
| Vengeance Bait Pellets | bromethalin | 432-746 | 1 | 100 lbs. | .01000 lbs. |
| Woodchuck Bombs | cyanide | * | 1 | 8 bombs | * |
| ZP Tracking Powder | zinc phosphide | 12455-16 | 2 | 3.21 lbs. | .32100 lbs. |

*unknown due to insufficient data

## V. Pest Information: Weeds

Maintenance of grounds around poultry facilities, water sources andmanure holding areas is considered critical in managing pest populations. Keeping weeds controlled or eradicated around poultry facilities helps keep rodent harborage down, as well as removing fly resting areas. Weeds can also restrictair flow to and from poultry houses. Therefore, herbicides may be part of a poultry producer's pest control program.

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