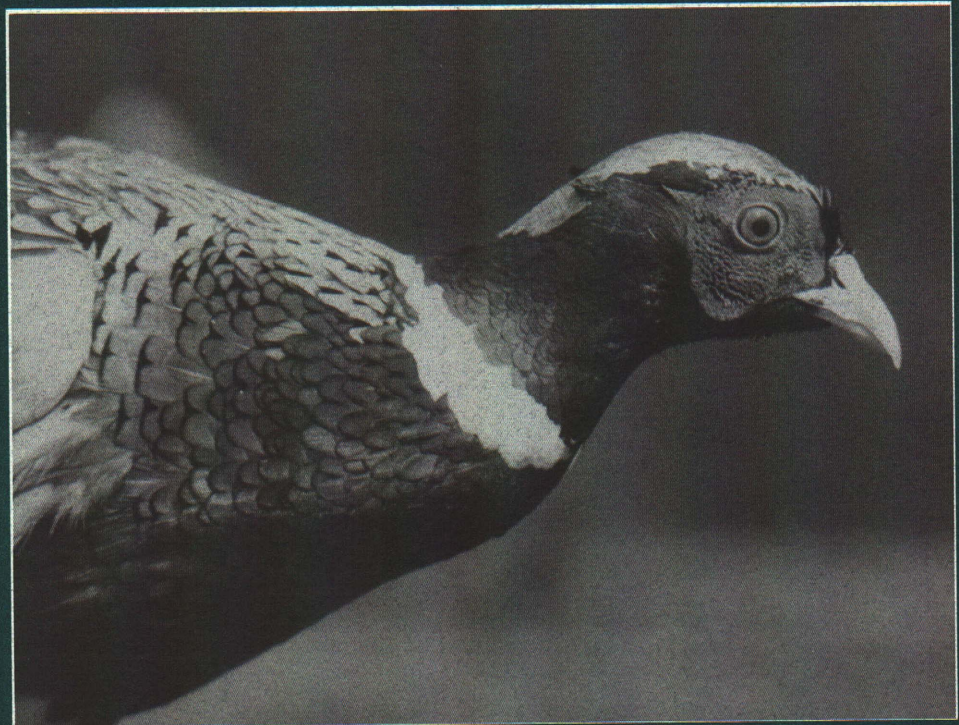




Managing Game Birds

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The wild game bird population in Michigan declined seriously during the 1950s and '60s. Pheasants used to be abundant in the lower half of the Lower Peninsula. Currently, pheasant restoration is vigorously being attempted, primarily by the introduction of a new strain of common pheasant from China. Early indications on this project are guardedly optimistic. The bobwhite quail was placed in the songbird (protected) category in hopes that it would be able to continue to survive as a wild bird. Some selected areas of Michigan have had a hunting season for quail.

The purpose of this bulletin is to assist people interested in raising game birds. Most of the information is related to pheasant production. However, the same information, or at least the same principles, can be used in producing chukars (partridges), grouse, wild turkeys, bobwhite quail, ducks, geese, etc.

There are many reasons for propagating game birds. Some fanciers keep birds as pets, or to study the unusual feather patterns, for a "back to nature" feeling or for some other reason.

Other growers produce birds for the meat market. A limited market for game birds exists in the hotel and restaurant business. A grower should investigate market potential before deciding to invest much time and effort in a game bird meat production enterprise.

Still other growers raise birds for release to the wild. In some states, local conservation clubs financially assist young people who raise pheasants for release. Some game bird producers sell to shooting preserves. Shooting preserves are becoming more plentiful as private hunting lands become scarcer, some kinds of game decrease in some localities and urban dwellers have more leisure time.

The shooting preserve operator usually releases birds each day for hunting. This is basically "put and take" because released birds must be harvested in a day or two. If they're not harvested within two days, they usually escape from the release area or fail to survive in the wild.

Michigan residents interested in raising game birds as a business should contact the Michigan

Department of Natural Resources, Game Division, Lansing, Michigan 48926. The state agency will provide a list of licensed Michigan game breeders from whom eggs and/or birds might be purchased.

Selecting Stock

Whether a game bird fancier selects fertile eggs, hatched chicks or mature breeding stock, it is important to buy with care. The beginner interested in raising only a few chicks might well buy 4- to 5-week-old birds rather than invest in expensive incubation and brooding equipment.

The source of breeder birds should be carefully considered:

- Does the game farm have a good reputation?
- Are the birds disease free?
- What are the details of management and nutrition of the parent flock?
- Do records of numbers of eggs laid and hatched indicate the breeders are prolific?
- Do a high percentage of chicks hatched live to adult size for breeding or release?
- Are the birds true to type for the particular breed or variety?
- Are birds suitable for release on shooting preserves — i.e., fully feathered with long tails and untrimmed beaks?

Care of Hatching Eggs

If you choose to hatch eggs, you must be able to hold them under proper conditions for good hatchability.

1. Eggs must be gathered frequently (at least three times daily).
2. Eggs should not be held longer than seven days at 55 to 60 degrees F and 65 percent relative humidity before setting in the incubator (Fig. 1).



3. Remove all undersized, oversized and odd-shaped eggs before setting them in the incubator.
4. Clean dirty eggs before setting to remove a source of bacterial infection. Eggs may be cleaned in commercially available sanitizer-detergent products or in a solution made by adding 1 ounce of 20 percent quaternary ammonium compound to 4 gallons of water. Dry cleaning (use a sandpaper brush) is permissible if the cleaned eggs are dipped in a sanitizing solution after brushing. Household bleaches are fine sanitizers if manufacturer's directions for sanitizing are followed. Remember to dip eggs into sanitizers — do not soak them!
5. Remove all cracked or weak-shelled eggs before setting.
6. Place eggs in incubator trays with the large end up (Fig. 2).

Incubation

Many game bird fanciers have successfully incubated eggs in old style, hand-operated incubators. Newer machines offer many mechanical improvements that reduce labor and decrease the uncertainty of incubation. Modern incubators generally provide:

- Force-draft ventilation.
- Mechanical egg turning mechanisms operated by a time clock.
- Window-view temperature and humidity recorders.
- More uniform and accurate temperature and humidity controls.
- Separate hatching units, which help to prevent the spread of disease from eggs to hatching chicks or vice versa.
- Choice of incubation trays for large, medium or small eggs.
- Larger capacity.

Preparing the incubator

To prepare the incubator:

1. Clean the machine, all trays and the incubator area with hot water and then sanitize with a disinfectant after each use. Phenol, quaternary ammonia or liquid chlorine bleach are effective — follow manufacturer's directions.
2. Fumigate the incubator and trays with formaldehyde (follow manufacturer's directions) or a suitable alternative.*



Fig. 1 — Proper storage before incubation is critical.

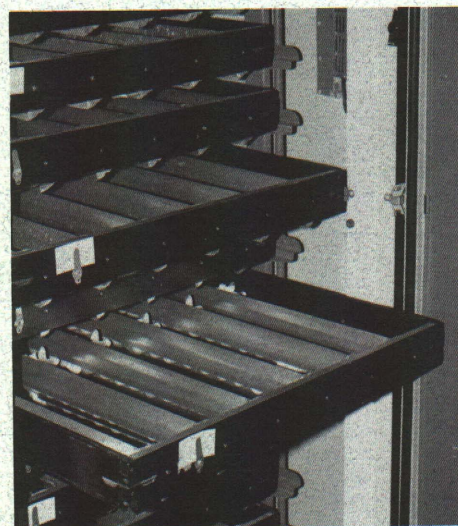


Fig. 2 — The incubator provides the right temperature and humidity for embryo development.



3. Start the incubator at least 72 hours before setting the eggs. Use this time to make necessary temperature and humidity adjustments.
4. Cover the floor of each hatching tray with cheesecloth to provide adequate footing for chicks.

Operating the incubator

Each incubator has its own operating peculiarities. Become familiar with these individual differences for success in hatching game bird eggs.

Most manufacturers specify recommended temperatures and humidity for their machines. If you do not have the manufacturer's directions, follow the guidelines in Table 1 for regulating incubator temperature, humidity and time of incubation.

It is important to turn the eggs periodically during incubation. In the nest, the hen performs this operation. Modern large incubators turn eggs automatically. Turning is regulated by a time clock mechanism. In smaller or older models, eggs must be turned by hand. If hand-turning, record the turn or tilt of the egg — otherwise,

you might not remember whether the eggs were turned. Hand-turn the eggs three times a day — at 7 a.m., noon and 7 p.m.

**Formaldehyde is no longer on the market, though private producers who still have some can still use it. New products are being developed and tested. Call the MSU poultry specialist for the latest information on formaldehyde alternatives.*

Brooding

Game bird chicks may be brooded in electrically heated battery brooders with raised wire floors, or in floor pens on litter. The battery method permits better observation of birds than floor rearing. Battery-raised chicks, however, do not acquire immunity from intestinal parasites as floor-reared chicks do. Brooding costs might be higher when batteries are used. Some experimental work has shown that battery brooding is best suited for quail, while floor pens equipped with hovers or heat lamps work well for pheasants. Battery-reared birds should be removed from the battery when they no longer require heat.

Table 1. Recommended temperature and humidity settings for forced-air incubators.

Kind of bird	Incubation chamber		Hatching chamber		Days in incubation center	Period in hatching chamber
	Temp (°F)	Humidity (%)	Temp (°F)	Humidity (%)		
Bobwhite (quail)	99½	60	99	85	1-19	After 19 days
Pheasants	99½	60	99	85	1-20	After 20 days
Chukars (partridge)	99½	65	99	85	1-19	After 19 days

Note: Candle eggs when transferring to hatching chamber and dispose of infertile eggs and those with dead embryos.

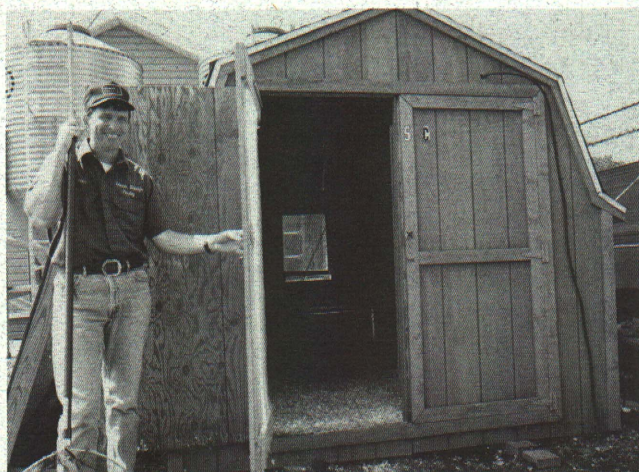


Fig. 3 – A well constructed brooder house protects chicks against predators and provides a dry, warm home.

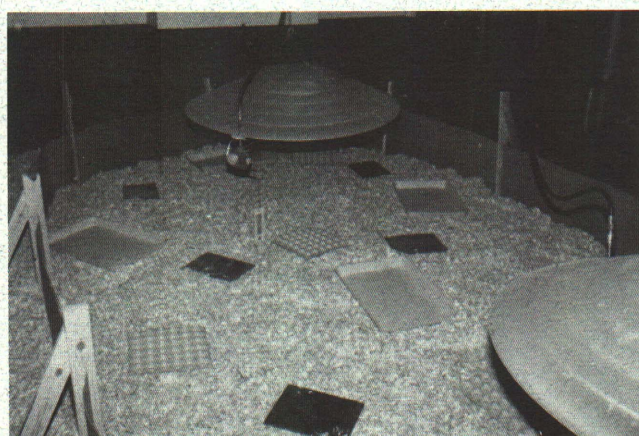


Fig. 4 – A clean brooder house with fresh litter, heat sources, feed trays and waterers is ready for a batch of chicks.

Preparing the brooder

Much of the success or failure of a game bird enterprise hinges on the management practices employed in brooding the young chicks.

- Brood in a well constructed, vermin-proof house (Fig. 3). Birds must be protected against rats and mice, mink, weasels, raccoons, owls, foxes, and domestic dogs and cats.
- Clean, disinfect and dry out the brooder house well in advance of the chicks' arrival.
- Add ½ inch of new, absorbent-type litter to floor pens (Fig. 4). Ranked in order of decreasing ability to absorb water, poultry litters

include: (1) crushed sugarcane, (2) corn cobs (dry, crushed), (3) peanut hulls and (4) wood shavings.

- Place a covering such as cheesecloth over the litter for the first week to prevent chicks from eating litter. Do not use newspaper — birds will slide on the smooth surface.
- Turn on brooder stoves or other heat sources at least 48 hours before chicks are scheduled to arrive. Regulate temperature at chick height to 95 degrees F. Reduce the temperature 5 degrees F each week until the birds no longer need added heat. If 250-watt heat lamps are used for brooding, suspend the lights 36 inches above the floor. Brooding results will be better if the chicks have a choice of temperatures. They will move from hot areas (95 degrees F) to warm areas (85 degrees F) if they want to cool off during their first week.
- Provide adequate ventilation. Ventilation is important for brooding birds. During cold weather, a well insulated house (batts or rigid foam) will help retain brooder heat and also permit adequate ventilation. Windows or exhaust fans, when properly adjusted, will provide adequate air exchange.
- Provide appropriate light. Many production facilities have too many windows — houses can become too hot or too light. Cannibalism can be a problem under these conditions. One 40-watt light bulb per 200 square feet of floor space is adequate if electric light is needed. A solid door that can be opened, with a screen door inside to confine the birds to the house or yard, is usually enough open space for light in a small house.

When chicks arrive

- Chicks should have water when they are placed under the heat source (Fig. 5). Their beaks should be dipped into water as they are put down. It is important that they locate water before feed. Feed should be made available an hour or two after the birds have been set out.



- For the first week, use 18-inch-high corrugated chick guards to confine chicks to the heat source. Form the guards into circles about 6 feet in diameter. Remove both guards and floor covering over litter after one week.
- Provide 1 linear inch of chick feeder space per chick to start, increasing to 2 or 3 linear inches per chick by the sixth week, depending on the type of bird being brooded.
- Provide two, 1-gallon water fountains per 100 chicks to start, and increase to two, 3-gallon fountains per 100 chicks by the sixth week. Place the waterer(s) on wire platform(s) to prevent water spillage in the litter. Make feed and water equipment changes gradually. Do not remove small feeders or waterers until birds have adjusted to larger ones.

Watering and Feeding

Proper feeding is important. Birds will waste much feed if the caretaker allows. Keep feeders full the first week, three-quarters full the second week and no more than half full thereafter. Raise feeders and waterers after the first week to keep litter out of them. Bricks or two-by-fours are useful for this purpose. The top edge or side of the feeder should be level with the bird's back or slightly higher. A wire-screened water stand (not

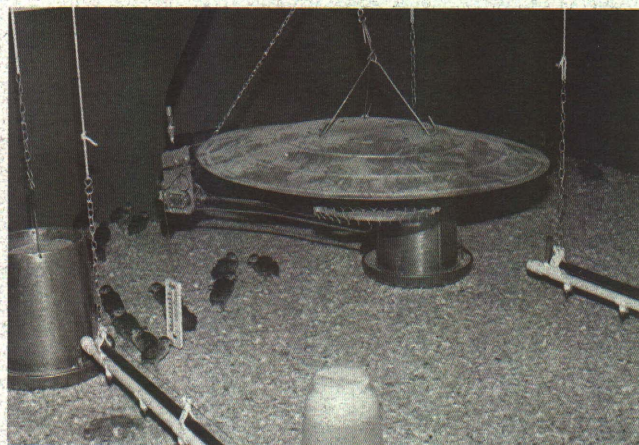


Fig. 5 – After the first week, chicks can move in and out of warmer areas near the heat source.

more than 2 inches high) will keep the birds out of the damp litter usually present around the water fountain.

Change water daily!

Convert to automatic waterers as soon as possible and clean daily.

Watch your game birds closely during all periods of brooding. When they are restless and chirping excessively, they may be too hot, too cold, catching cold, out of feed or out of water. The best indicator that all is well is good distribution of the birds over the floor, with some sleeping on the litter.

Nutrition

Game bird and chicken nutrition differ in that game birds require a higher level of protein during early life. If high quality commercial game bird feeds are not available through local feed companies, a 28 percent protein turkey starter feed will usually provide well balanced game bird nutrition.

Starter feed

During the first five to six weeks of life, quail, partridges and pheasants should receive only high protein starter feed (28 to 30 percent) with no additional grain. For best results and the least feed wastage, the starter feed should be in mash form the first two weeks, small crumble form the third and fourth weeks, and small pellets thereafter.

Grain feeding

Grain feeding may be introduced at about the fifth week. Start with an evening feeding and give only a small amount that the birds will clean up without wastage. When whole grain feeding is begun and grain is fed in combination with pellets, be sure to provide grit at all times in separate hoppers. If cracked, crushed or milled grains are utilized, grit is not necessary.



DON'T OVERFEED GRAIN or your game birds may not get a proper balance of the essential nutrients contained in the pellets.

After the 10th week, grain may be fed in the morning and the evening.

Wet mashes or special feeds

There is no good evidence that wet mash is beneficial to game birds. Extra labor is required to prepare it, and wet feeds may spoil and cause harmful bacterial contamination. Wet feeds can also cling to toes and beaks, contributing to cannibalism and other problems.

Maintenance

After the 12th week, most of the early growth is completed and protein and other nutrients in the ration can be reduced appreciably. The starter ration may be fed after the early critical growth period, but it should be combined with increasing amounts of corn. The maintenance ration shown in Table 2 would normally be fed after the 13th week until just before release or the breeding season.

A suggested feeding program for game birds is:

Age of birds	Whole grain feeding		Feed
Weeks	Morning	Evening	
0 - 6	-	-	Starter
7 - 12	-	+	Grower
13 until release or 1 month before breeding	-	+	Maintenance ration
From 1 month before breeding	-	-	Breeder ration

Breeder rations

Nutritional requirements for game birds change at breeding time. For good hatchability, you must feed high quality breeder rations. Start breeding

birds on a breeder ration at least one month before the breeding season.

For best results, the change from a maintenance feed to a breeder diet should occur gradually over a five-day period. To change feeds, mix equal quantities of the two feeds together at first, then remove 25 percent of the maintenance feed each day.

Disease Prevention

Disease prevention in game birds is far more effective than disease treatment after problems arise.

Game birds raised in confinement are subject to many of the same diseases that affect other poultry, and in most instances they respond to the same treatment. Virulent disease microorganisms can pass from bird to bird much more rapidly in confinement than in the wild. Biting insects are a possible source of disease transfer in wild game bird populations. It is difficult to find sick or dead game birds, because sick ones will not come out in the open and are usually well hidden by their plumage. Predatory animals usually account for many of those that die in the wild. Therefore, it is difficult to know whether a particular disease is widespread in an area.

For diagnosis of suspected disease problems, contact your local veterinarian. He/she may refer you to the state poultry pathologist.

Medication

During periods of stress — when weather is cold and wet or when birds are being moved — it may be advisable to feed a medicated ration for 5 to 7 days — before, during and after the stress. Feeds can be fortified with approximately 100 grams per ton of a suitable antibiotic during such periods. The cost of these drugs usually prohibits feeding at high levels for longer than 5 to 7 days.

Game birds are susceptible to coccidiosis, so it is important to include a coccidiostat in starting



Table 2. Complete rations for pheasants and other game birds.

Ingredients	Pounds per ton			
	Starter ^a	Grower ^a	Maint. ^a	Breeder ^a
Corn, yellow	725.5	1082	1035	970.5
Soybean meal, 44%	935	548	48	312
Alfalfa meal, 17%	60	60	60	60
Wheat std. middlings	100	100	500	420
Oats	—	100	250	—
Meat and bonemeal, 50%	50	50	50	50
Dried whey	60	—	—	60
Limestone	25	25	25	90
Dicalcium phosphate	25	20	17	20
Salt	5	5	5	5
Methionine, DI	2	—	—	—
Premix ^b	<u>12.5</u>	<u>10</u>	<u>10</u>	<u>12.5</u>
TOTAL	2000	2000	2000	2000
Calculated analysis				
Crude protein, %	27.00	20.00	13.00	17.00
Crude fat, %	2.27	2.97	3.90	3.23
Crude fiber, %	5.35	4.87	5.19	4.47
Calcium, %	1.23	1.10	1.01	2.35
Phosphorus, avail. %	.55	.45	.40	.47
Metabolizable energy, kcal/lb	1135	1240	1220	1150

^a To be fed: starter, 0 to 6 weeks; grower 7 to 12 weeks; maintenance, 13 weeks to release or one month before breeding; breeder, one month before collecting eggs for hatching.

^b See Table 3 for description of vitamin-trace mineral premixes.



and growing feeds for birds raised in confinement. Several effective coccidiostats are commercially available for inclusion in game bird rations, and they should be fed according to the manufacturer's directions. Water treatment with soluble sulfa compounds can also be used successfully.

Examples of typical starting, growing, maintenance and breeder rations for game birds are shown in Table 2. Analysis of a vitamin-trace mineral premix suitable for game birds is shown in Table 3.

Table 3. A suggested vitamin-trace mineral premix for game birds.

Ingredients	Per 10 pounds of premix
Vitamin A, IU	12,000,000
Vitamin D ₃ , ICU	2,000,000
Vitamin E, IU	20,000
Riboflavin, gm	8
Calcium pantothenate, gm	14
Niacin, gm	40
Choline chloride, gm	800
Vitamin B ₁₂ , mg	20
Folic acid, mg	1,000
Menadione sodium bisulfite, gm	3
Biotin, mg	100
BHT, gm	225
Manganese, gm	66
Zinc, gm	48
Iron, gm	30
Copper, gm	4
Iodine, gm	1.5
Cobalt, gm	.2
Selenium (at, 2 mg/kg of feed)	
<u>Premix per ton of complete feed</u>	
Starter	12½ pounds
Grower	10 pounds
Flight & maintenance	10 pounds
Breeder	12½ pounds

* Similar or equivalent vitamin-trace mineral premixes may be available from the following companies:

Carl S. Akey, Inc., P.O. Box 129, Lewisburg, OH 45338.

Dawe's Laboratory, 4801 W. Peterson, Chicago, IL 60646.



Vaccination

A game bird breeder with a large operation may decide to vaccinate for some of the diseases that may infect commercial poultry farms. Vaccines are available for infectious bronchitis, Newcastle disease and fowl pox. Though most game birds are fairly resistant to these diseases, immunization may be wise when large quantities of birds are concentrated. Before vaccinating, you might want to consult with the state veterinarian's office or the Animal Science Department at Michigan State University.

Nutrition in disease prevention

Well balanced nutrition is one of the most important requirements for maintaining disease-free birds. If game birds receive balanced rations, deficiency diseases are not a problem, and well nourished birds more easily resist the invasion of disease organisms.

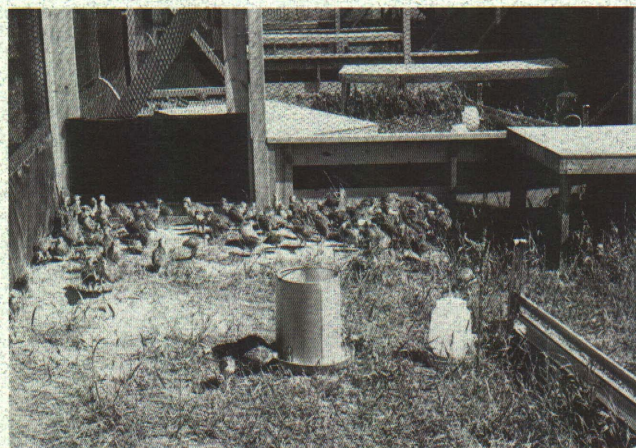
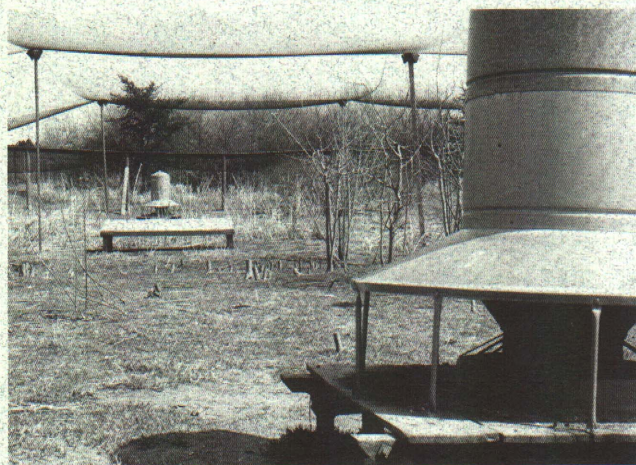
Sanitation

To many people, sanitation means the use of disinfectants or medications. In actual practice, disinfectants do little or no good unless all organic matter — dirt, dust, litter, manure, etc. — is removed before the disinfectant is applied. This means that all houses and feeding, watering and other equipment used for brooding and rearing game birds must be soaked and dirt and droppings scraped off before the disinfectant can kill the remaining microorganisms. Antibiotics help control certain respiratory and intestinal infections, but they are not a substitute for good management that keeps birds clean, dry and properly fed. Drug costs can easily become prohibitive if drugs are used as a substitute for cleanliness, good planning and management.

Rotating grass runs

The game bird breeder who uses the same grass run each year is likely to have disease and parasite problems. Many worm eggs and disease-producing organisms remain viable in the soil for several years.

Game bird runs should be located on sandy loam soil with good slope for drainage (Figs. 6 & 7). If there is adequate land on the game farm, runs should be rotated and not used more than once every three years. If land is limited and must be used each year, the run should be plowed to a 7-inch depth after each use and planted with a fast-growing cover crop, such as rye, to help reduce disease and parasite problems.



Figs. 6 & 7 — Proper management of outdoor runs for growing birds minimizes disease and parasite problems.



Quarantine

If older birds are brought onto the farm where game birds are housed or ranged, the new arrivals should be quarantined for at least two weeks. This means complete isolation, with disinfection pans at the door and a special pair of rubber boots for use inside.

Diseases, Common Problems

If disease does strike your game birds, it is important to take the following steps:

- Recognize symptoms early.
- Consult your local veterinarian as soon as possible. He/she may refer you to a poultry pathologist.
- Follow the veterinarian's recommendations exactly.

This procedure can mean the difference between success or failure. It can save time and reduce the practice of costly (usually ineffective) home medication.

Game birds are susceptible to most of the common diseases of poultry. Medications used to treat poultry diseases are usually successful on game birds. The dosage may need to be varied because of the smaller sizes of some of the game birds. The following are some common problems of confined game bird flocks.

Worms

Worms (internal parasites) are a problem in game bird production if birds are grown on infected premises. It is almost impossible to keep flight pens and breeder yards free of worm infestations without a three-year rotation system. It is very expensive to have enough yard area to allow for a three-year rotation. But, to control worms, it is almost essential to keep the birds on ground

where there have been no birds for the preceding two years.

It is doubtful that worms directly kill birds. But worms usually affect growth rate, feed consumption and susceptibility to other diseases.

One cause of worm infestation is poor environment. Wet, poorly drained growing and breeding pens are conducive to worm infestations.

Roundworms

Roundworms are usually $\frac{1}{2}$ to 3 inches long and found in the small intestine. They are usually white or creamy in color and somewhat firm in texture. The life cycle of the roundworm is rather simple: the female roundworm produces large numbers of eggs, which can pass from an infected bird into droppings. If the temperature is 65 to 90 degrees F and relative humidity 60 to 90 percent, the eggs will reach an infective stage in approximately 10 days. If a bird swallows some of these infective eggs, it will develop roundworms.

Very light or mild infestations of roundworms have few, if any, symptoms. In heavy infestations, birds become droopy and their feathers are ruffled. They may have some diarrhea and weight loss. Occasionally, roundworms are visible in the droppings.

Usually, the older the birds, the more resistant they are to roundworm infestations. It is very important, therefore, to raise young stock in a worm-free environment. Older birds that are not well fed and cared for are likewise susceptible to roundworm infestations.

Tapeworms

Tapeworms are also found in the small intestine. The tapeworm attaches its head to the intestinal wall by means of suction cups and a hooklike beak. The rest of the worm is segmented; the segments on the end of the worm become filled with eggs as the tapeworm matures. The segments then drop off into the intestine and are excreted.



The eggs in the segments do not become infective until they are consumed by an intermediate host. These hosts vary with the species of tapeworm and include various insects, slugs, snails and earthworms. Game birds become infected with tapeworms by eating those hosts that have eaten the egg-filled segments.

Gapeworms

Gapeworms infect game birds by attaching themselves to the wall of the bird's trachea. They are also called redworms because of their somewhat reddish color. This is particularly true of the female gapeworm, which is darker red and much larger than the male (females are almost an inch long). The male is permanently attached to the female, so this worm is often called the "Y" worm, because the two of them together resemble the letter Y.

Gapeworms can be transmitted directly from the host bird to an uninfected bird through worm eggs in the droppings. They can also be passed through an infected earthworm that picked up gapeworm larvae while feeding in contaminated soil.

Eggs shed by the female gapeworm into the trachea reach the mouth cavity of the infested bird. The eggs are then swallowed and pass through the bird into the droppings. Moisture and temperature conditions must be right for the worm eggs to mature.

Young game birds are especially susceptible to gapeworm infestation. Infested young birds can be suffocated by the rapidly growing worms in the trachea.

Coccidiosis

Coccidiosis, one of the most widespread diseases of domestic poultry, is a serious problem with game birds.

Coccidiosis, a disease of the small intestine, is caused by a single-celled organism (a proto-

zoan). The several strains or species of the organism have similar life cycles. They may affect different parts of the small intestine, but control is similar in all cases.

Eggs are passed out through the droppings of infected birds. The eggs are not infective then but require an incubation period before they can cause an infection. Warm and humid conditions can make these eggs infective in just two days. Through division, each egg is capable of becoming eight infecting organisms, called sporozoites.

After being consumed by the game bird, these sporozoites invade the intestinal wall. Inside the intestinal wall, they redivide many times, causing the cell wall to become enlarged and rupture. This allows the organisms to enter other cells in the intestinal wall and redivide, causing more cell walls to rupture. Coccidiosis can cause considerable damage to the cell walls in the intestines. Droppings of the infected birds may become bloody. Mortality can be quite heavy.

Pullorum Disease

Pullorum disease is an acute infection of young poultry caused by a bacterium. The disease has been called bacillary white diarrhea (BWD) because it causes white diarrhea. Pullorum has been eradicated from most commercial poultry flocks but remains endemic in a few flocks of backyard poultry and game birds. The disease can spread from hen to chick via the egg, in the incubator and hatchers, in chick boxes, on equipment and by carrier birds. An infected flock can not be treated and kept for breeding — it can only be slaughtered for market. Pullorum is handled only by eradication by state poultry agencies in cooperation with the National Poultry Improvement Plan by blood testing all breeding flocks and breeder replacement flocks. Though pullorum has not been a problem in commercially grown game birds, blood testing of breeder flocks is highly recommended.



Disease Control

Sanitation is a critical component in the control of worms and coccidiosis. In all cases of worms and coccidiosis, droppings carry the infective (or potentially infective) agent. Frequent removal of droppings will reduce chances of infection. If worms or coccidiosis becomes a problem, clean the brooder house weekly and maintain dry, well rotated outside pens.

Drugs are available to assist in the control of worms and coccidiosis. The problem should first be properly identified — then appropriate drugs can be prescribed. A local veterinarian; the state veterinarian's office, Michigan Department of Agriculture Animal Industry Division, P.O. Box 30017, Lansing, MI 48909; or the Michigan State University Animal Health Diagnostic Laboratory, P.O. Box 30076, Lansing, MI 48909-7576, will help in the diagnosis and treatment.

Some people in the poultry industry believe that coccidiosis can be controlled by immunization. Immunization is built up by slow, controlled exposure to the coccidiosis organisms. This technique has had mixed results and is not recommended for game birds.

Another approach proposed in the commercial poultry industry that may be of some value to the game bird breeder is the development of genetic resistance to coccidiosis. Geneticists have shown that resistance to this disease can be developed through breeding. They select for so many other traits that they tend to neglect coccidiosis, however, especially since it is so easy and inexpensive to control it through sanitation and drugs.

External Parasites

Lice

Lice are one of the most widespread external parasites of birds. They cause skin irritation and leave infested birds restless. Heavy lice infestation can interfere with normal body growth and egg production.

Lice spend their entire life on the body of the bird. They irritate the bird by chewing the skin and sometimes drawing blood. They also attack new feathers at their base and may puncture the feather and draw blood.

Do everything possible to eliminate lice from game birds. Over the years, many treatments have been made available to effectively control lice on birds. Some pesticides formerly used on lice are no longer allowed, however. For the proper method of treatment, check with your county Extension agriculture agent, the MSU Entomology Department or the MSU Animal Science Department.

Mites

Many people classify mites and lice together. Though they are both external parasites, they are quite different in the way they live.

Common Red Mite

The common red mite sucks blood out of the bird, usually at night. During the daytime, the mites are not on the birds but in cracks and crevices in the game bird house and, often, under dried, caked manure. In severe infestations, excessive blood loss can cause a serious problem.

It is possible to eliminate red mites rather easily by thoroughly cleaning the house. Soaking the cracks and crevices with crankcase oil or fuel oil helps greatly in controlling mites.

Northern Fowl Mite

The northern fowl mite is a small, reddish brown arachnid (eight legs, like a spider) that infests a wide variety of domestic fowl and wild birds and is the most important and common external parasite of poultry. This mite congregates on the vent, then the tail, back and legs of female birds; they are more scattered on male birds. The northern fowl mite completes its entire life cycle on the bird, though it can survive off the host for two or three weeks. The feathers of birds infested with this mite become dirty from eggs and mite excrement, and the bird's skin can become irri-



tated and scabby. Mite populations can rise rapidly after the bird becomes infested, especially during the winter. For the proper treatment method, check with your county Extension agriculture agent or the Entomology or Animal Science departments at Michigan State University.

Cannibalism

Another serious problem in the game bird business is cannibalism. This occurs among chicks, growing birds and mature birds. Heavy death loss can result from a severe outbreak of cannibalism.

Cannibalism is usually sporadic and can be the result of toe picking, feather pulling or fighting for breeding territory. It is frequently possible to watch a flock develop cannibalistic behavior.

Though it is normal for one or two of the larger birds to dominate the other birds according to a well established social system or "pecking order", this can lead to cannibalism.

Cannibalism is generally thought to be caused by too much or too little of something, such as too much heat or light, overcrowding or lack of water. There are probably many other causes.

Cannibalism Control

There are several ways to control cannibalism. If cannibalism seems to be a problem, first check the feed — be sure you're feeding the right feed and birds have food in front of them all the time. Make sure birds have enough feeder space that they can all eat at the same time. If this is not possible, they will start fighting for feeder space. Fighting draws blood and starts cannibalism.

Crowding can also contribute to cannibalism. Crowding starts to become a problem in birds four weeks of age and older. Breeding males also fight for territory. Pheasants should be given as much room as possible at breeding time.

Another control method is beak trimming. However, beak trimming detracts from the bird's

appearance. Beak-trimmed birds have had the top beak cut off or removed about halfway between the tip and the nostrils, and the bottom beak removed about a quarter of the way from the tip to the nostrils. Poultry producers use an electrically heated knife that cuts off and sears the beak at the same time to prevent bleeding. Chickens are beak-trimmed at a very young age, usually in the first two weeks of life.

Cannibalism is also controlled through the use of specks (Fig. 8). Specks look like reading glasses for the bird. They fit over the beak with a plastic pin attached through the nostril. They differ from reading glasses in that they are blinders, made of opaque plastic. The bird can see to the right or left, up and down, but not straight ahead. The bird becomes quite adept at finding its way around the pen. The specks are easily removed by clipping the plastic pin.

Commercial Pheasant Production

Markets are available for commercially produced pheasants. Demand for pheasants for shooting preserves starts in August and lasts until April. This is a long marketing season. Demand for



Fig. 8 — Putting specks on birds is one way to control cannibalism.



meat birds by hotels and restaurants may be seasonal but tends to be spread over several months. Special management problems can develop when raising large numbers of birds to be marketed over long periods of time.

Some of the areas of commercial pheasant production that require special consideration are:

- Breeder flock management.
- Hatchery scheduling (egg production, hatching and rearing).
- Disease.
- Space requirements.
- Feed requirements.
- Transportation of birds.
- The ideal bird for the dressed market.
- The ideal bird for shooting preserves.

The Breeder Flock

Pheasants can be managed to produce fertile eggs at any time of the year. Egg production requires proper feeds, proper lighting, adequate ventilation and well constructed laying houses. Feed for breeders should resemble that listed under "Breeder" in Table 2 on page 8.

For egg production, pheasants require at least two different lighting periods during their lifetime. For maximum egg production, a minimum of 14 hours of light (either daylight or electric light or some combination) are needed each day. This photoperiod should never decrease during the egg production period. Light stimulates egg production, so decreasing the hours of light per day will tend to depress egg production.

The longest day in Michigan provides approximately 15½ hours of daylight. To extend the egg production of your pheasant flock, provide artificial light after June 21 to maintain 15½ hours of daylight. It is also possible to bring the breeders into production earlier in the spring by providing 14 hours of light 2 weeks before you want egg production to begin.

If hens are not laying well, they can be "recycled" by giving them a 10-week rest. This is done by turning out the lights. The flock should also be put on a subsistence diet until egg production completely stops. The house must be windowless to eliminate daylight completely. The birds can then be put on an 8-hour light day (they think it is winter). Ten weeks later when the clock is adjusted to 14 hours of light, they think it is spring and start laying eggs again. Pheasant hens will lay at any time of the year when at least 14 hours of light are provided after a 10-week period of 8-hour light days.

Most breeder pheasants require 25 to 30 square feet of space per bird in outdoor pens (Fig. 9). Nests are sometimes provided (Fig. 10), but the birds generally do not use them. They lay eggs at any convenient location—almost wherever they happen to be. Frequent collecting is necessary to prevent the birds from eating the eggs.

One male per eight to 12 females is sufficient for fertility. Having too many males leads to fighting. Using specks on the females will cut down on cannibalism. It will also cut down on some of the flying, particularly flying into fences.

Birds confined to breeding pens in houses need no more than 4 square feet per bird. Light must be controlled (kept fairly dark) to prevent cannibalism. Ventilating fans are necessary to supply 4 cubic feet of air per minute per bird for confined breeder birds to keep the layers cool during warm weather.

Scheduling

You must develop a schedule to produce quantities of pheasant chicks over long periods. Keep the following needs in mind:

- How many chicks do you need?
- Is the demand regular or does it fluctuate?
- When do the chicks need to be started or the adults finished?



It takes 2 weeks after lighting the breeders for egg production to start. After approximately 2 weeks, there should be enough eggs for the first setting. After that, eggs should be set each week. Set eggs twice a week to maximize hatchability. The incubation period for pheasant eggs is 24 days. Thus, it takes 7 or 8 weeks from the time that you begin providing 14-hour light days to produce the first chicks.

How many chicks will a breeder hen produce? Most breeders do not expect more than 40 to 50 chicks per hen, but properly managed breeder flocks can produce 50 to 60 chicks per breeder. Most of the chicks will be produced in the first 4 months of egg production. To produce more chicks, the breeder flock (or a portion of it) can be recycled during the 10 weeks of hot weather. Chicks can then be produced during September, October and November with the recycled layers.

Space Requirements

The breeder flock requires 25 to 30 square feet per bird in outside or fly pens, so a flock of 500 breeder birds requires a pen 100 by 150 feet. In a house with light control, 4 square feet are needed per bird, so 500 breeders need 2,000 square feet or a house 40 feet by 50 feet.

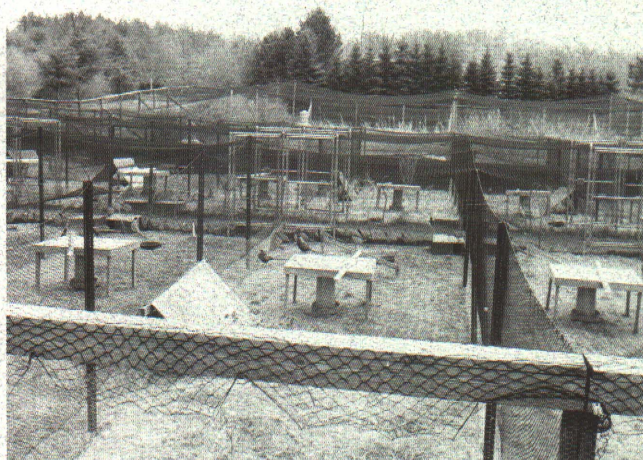


Fig. 9 – Breeder pens provide plenty of space for birds, as well as shelter, water and feeders.

Giving growing birds plenty of room helps prevent cannibalism. This additional room also helps control disease, which becomes more of a problem as birds become more closely confined. Recently, young pheasants (1 day old through 8 weeks) have been raised at Michigan State University with less than 1 square foot per bird in the brooder house. These birds were raised with subdued (blue, red and white) light to control cannibalism. Care must be taken when birds raised under darkened conditions are released into outside pens. The birds may become temporarily (and some probably permanently) blinded by the sunshine. To condition the birds' eyes to light, turn on lights in the darkened growing pens for three or four days before releasing birds to the fly pens. The day length indoors with artificial light should be the same as the natural day length outdoors.

Feed Requirements

Table 4 is a guide for feed requirements of pheasants. It assumes that the birds were raised according to the management practices recommended in this publication. If more than these amounts are being fed, investigate feed wastage, feed quality or type of feed.

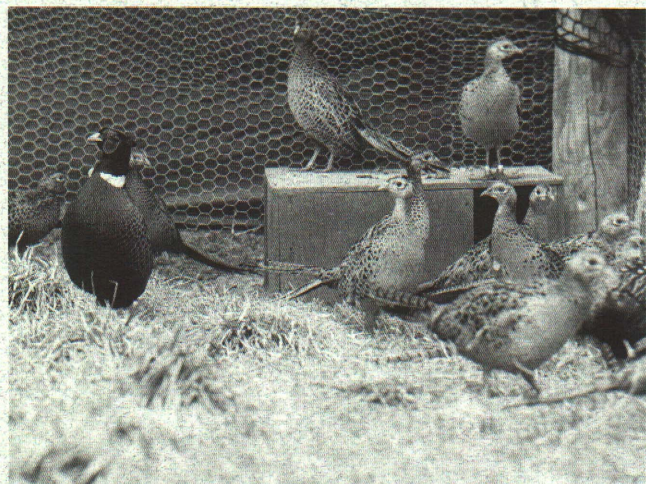


Fig. 10 – Some growers provide nest boxes, but pheasants generally don't use them.



Table 4. Feed required per bird from 1 day old to 20 weeks of age, and for hens producing eggs.

Growth period	Pounds required per bird	
	Per growth period	Cumulative*
1 day old to 4 weeks	1.20	—
4 to 8 weeks	3.10	4.30
9 to 12 weeks	4.20	8.50
13 to 16 weeks	4.75	13.25
17 to 20 weeks	5.25	18.50
Hens producing eggs	—	1.25

*Running totals of period (column 2); for example $4.30 = 1.20 + 3.10$.

Transporting Birds

The most important unsolved problem of the pheasant business is transporting or handling pheasants. Actual transportation is not a problem—catching the birds and filling the crates is the difficult job (Figs. 11 and 12).

Pheasants can easily be transported in poultry crates, though it is probably better to use crates made especially for pheasants. These should be shorter in height than the standard chicken crate (Fig. 13). Birds in a chicken crate often jump and can damage their heads on the tops of the crates. The shorter crate limits jumping and reduces the possibility of damaged heads.

Handling the birds is difficult because the pheasant is a wild bird that cannot be caught easily. It struggles when caught, regardless of how many times it is handled. Wings and legs are easily broken and feathers pulled.

A long-handled net is the best way to catch the birds. This means handling each bird, which is a slow operation. If there are many birds to handle, plan for sufficient time and labor.

Dressed-market Birds

There are no commercial quality standards for pheasants marketed as dressed birds. Your buyer will tell you if he/she has any preferences.

Pheasant breeders should concentrate on developing a fast-feathering, rapidly growing bird. This bird should reach an adult live weight of 3 to 3½ pounds (female). When marketed at ready-to-cook weights, males should weigh 2 to 2½ pounds; females, 2 to 2¼ pounds. Birds should reach these weights by the time the males are 16 weeks of age and the females 16 to 18 weeks of age.

The birds should be fully feathered with adult plumage. Nothing makes ready-to-cook birds look worse than dark pin feathers that either cannot be picked or cannot be easily picked. They will not look good in the package.



Shooting Preserve Birds

The commercial shooting preserve is a large market for pheasants from August through April. The birds should be well feathered and well grown, alert and healthy. They should not be fat. Young birds 16 to 20 weeks old generally will not be too fat. Birds kept after they are full feathered adults can become overweight. Birds to be used by shooting preserves should be grown in outdoor flight pens to maximize flying ability and other wild traits (Fig. 14).

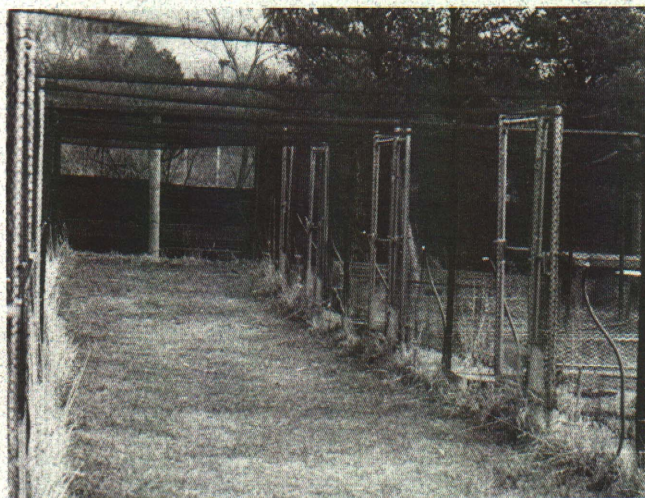


Fig. 11 — Driving birds from their pens into a catching corridor makes catching them somewhat easier.

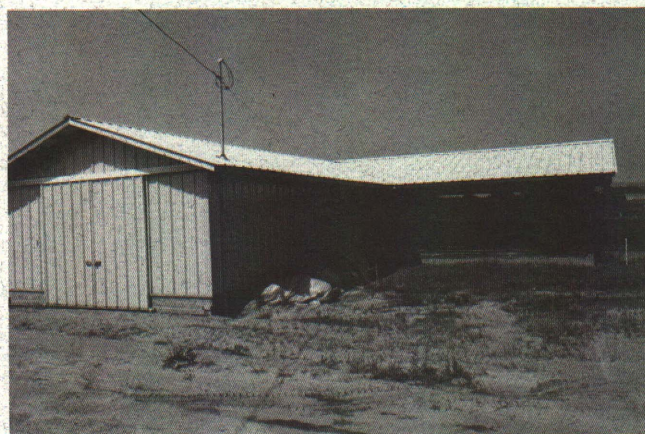


Fig. 12 — A covered catching pen is handy for catching birds, especially in wet weather.

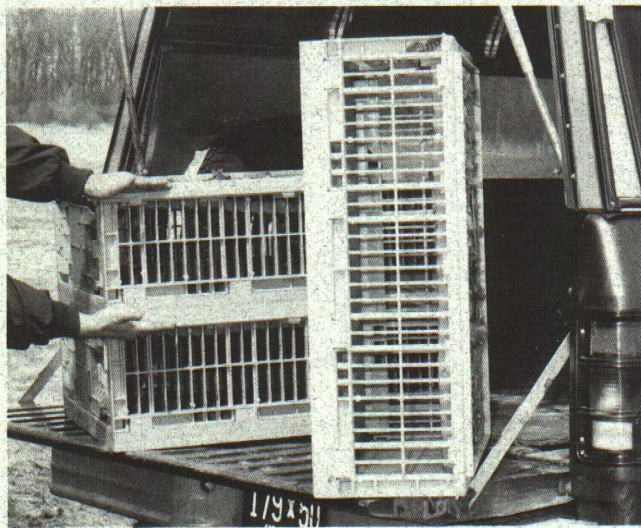


Fig. 13— Specially made pheasant crates limit jumping and damage to birds during transport.

Disease Control

Hexamitiasis is a disease sometimes found in large flocks of pheasants. More commonly found in turkeys, it is caused by a protozoan organism in the bird's intestinal tract. The disease is generally found in young birds, from 1 to 4 weeks of age. The birds seem to develop immunity to the disease as they get older. Mortality can be as high as 25 to 30 percent of the young birds.

Diagnosis is a problem because the disease has no distinctive symptoms—the birds just look sick. If you suspect hexamitiasis, seek a veterinarian who knows poultry diseases. He/she probably has had experience with this disease and will be able to make a proper diagnosis.

For control, institute all possible sanitation practices. Clean pens at least once each week—the organism is harbored in litter and transferred from one bird to another in the droppings. Use foot dip disinfectant pans between pens. Cut down the traffic between pens. Eliminate traffic between old birds (carriers) and young birds. Isolate the breeder flock from young birds.

The first hatches may not show signs of the disease, but it will get progressively more severe with successive hatches. Apparently, time is



needed to develop a highly infectious organism and a concentration of the infective organism sufficient to cause a severe outbreak of hexamitiasis.

Assistance in Game Bird Production

Many people do not realize that many sources of information and assistance are available for game bird producers. Feed companies are a very good source of information. Many industries allied to the poultry business have some literature either directly or indirectly related to game bird management. Simple poultry management practices are helpful. Game bird management practices are very similar, but not identical, to those of poultry. Feed companies, particularly those of national size and scope, frequently have diagnostic services that are sometimes available to people using their feeds.

Some periodicals available to assist in game bird management are: *The Game Bird Breeders*, *Aviculturists*, *Zoologists and Conservationists Gazette*, 1155 East 4780 South, Salt Lake City, Utah 48105; and *Wildlife Harvest*, P.O. Box 96, Goose Lake, Iowa 52750. Other sources of

printed literature are: the U.S. Department of Agriculture, Washington, D.C.; the Michigan Department of Natural Resources, Game Division, Lansing, Michigan 48926; Conservation Department, Olin Industries, East Alton, Illinois 62024.

Licenses and Permits

Anyone interested in raising ringneck pheasants, bobwhite quail, wild turkeys, waterfowl or other protected birds must purchase a game breeder's license to keep the stock in captivity. By law, an importation permit must be obtained and game birds must be inspected before they are shipped into Michigan. This prohibits the shipment of diseased or otherwise undesirable birds into the state.

Other licenses and permits of interest: a possession permit for anyone who keeps a game bird as a pet; a public exhibition permit for those who place game birds on public display; and a shooting preserve license for individuals who make pen-reared pheasants, bobwhite quail and mallard ducks available to hunters on a fee basis.

Applications for licenses and permits are available from the Game Division, Department of Natural Resources, State of Michigan, Lansing, Michigan 48926.



Fig. 14 – A sight barrier of sheet plastic keeps growing birds from becoming used to people. Note the two electric wires outside the fence to protect birds against predators.



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