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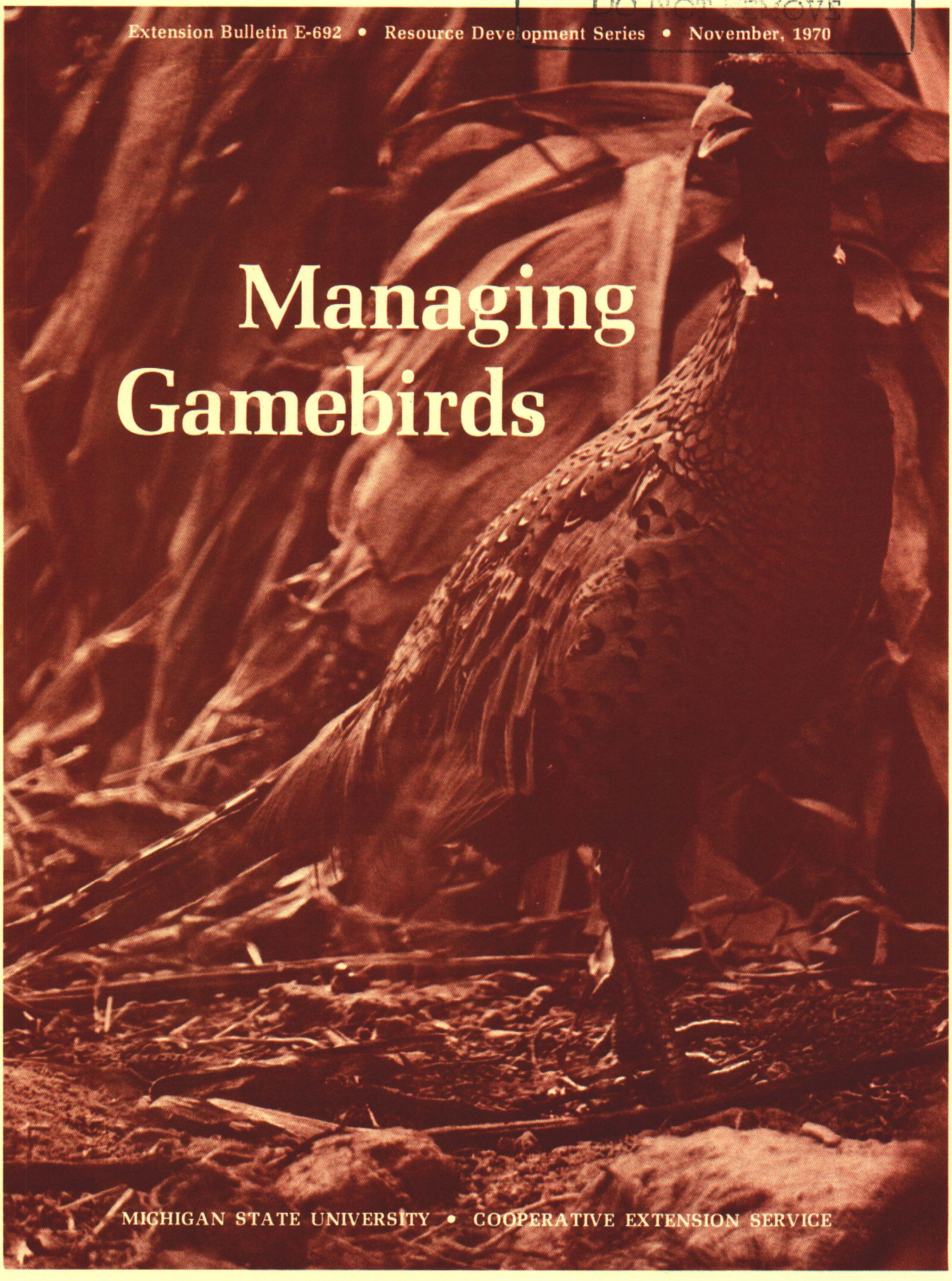

Managing Gamebirds

MICHIGAN STATE UNIVERSITY • COOPERATIVE EXTENSION SERVICE

Managing Gamebirds

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Game bird population in Michigan has declined seriously during the 1950's and 1960's. Pheasants used to be abundant in the lower half of the lower peninsula. The "bobwhite" quail was placed in the song bird (protected) category in hopes that it would be able to continue to survive as a wild bird. Recently, some selected areas of Michigan have had a hunting season for quail.

The purpose of this bulletin is to assist those interested in game bird culture. Most of the information is related to pheasant production. However, little change would be required to use the same information, or at least the same principles, in producing chukars, grouse, wild turkeys, bobwhite quail, ducks, geese, etc.

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

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

Still other growers wish to release their birds. 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 due to the scarcity of hunting lands, a decrease in some kinds of game in some localities, and more leisure time for urban dwellers.

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

Michigan residents interested in the business of raising game birds should contact the Michigan Department of Natural Resources, Game Division, in Lansing, Michigan 48926. The state agency will provide a list of licensed Michigan game breeders from whom eggs and/or birds might be purchased.

Selection of 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 4-5 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?
- Are the breeders prolific, based on hatchability records?
- How good is the livability of the young?
- Are the birds true to type for the particular breed or variety?
- Are birds suitable for release on shooting preserves?

These are a few of the questions that must be carefully considered and answered before selecting game birds.

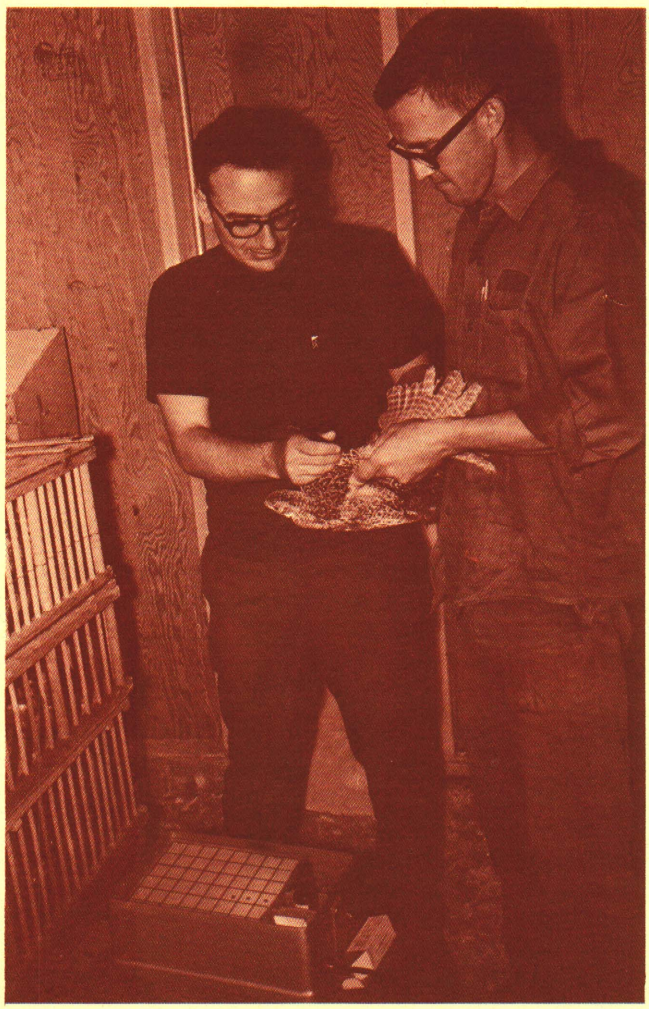

Figure 1. Blood-testing breeder stock.

Care of Hatching Eggs

If eggs are selected for hatching, they must be held under proper conditions for good hatchability.

Specific requirements for holding game bird hatching eggs include:

1. Eggs must be gathered frequently (at least three times daily).
2. Eggs should not be held longer than seven days before setting in the incubator.
3. Hold eggs at 55° F. temperature and 65% relative humidity.
4. Remove all undersized, oversized, and odd-shaped eggs before setting in the incubator.
5. Clean dirty eggs (before setting) to remove source of bacterial infection (eggs may be cleaned in commercially available sanitizer-detergent products, or use 1 ounce of 20% quaternary ammonium compound to each 4 gallons of water). Dry cleaning (use a sandpaper brush) is permissible if the cleaned eggs are dipped in a sanitizing solution. Household bleaches are fine sanitizers if directions for sanitizing are followed. Remember to dip eggs into sanitizers. **Do Not Soak Them!**
6. Remove all cracked or weak-shelled eggs before setting.
7. Place eggs in incubator trays with large end up.

Incubation

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

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

Preparing the Incubator

A few fundamental rules to follow when preparing your incubator include:

1. Clean the machine, all trays and the incubator area with **hot** water and then with a disinfectant after each use (Phenol, quaternary or household bleaching compounds are effective—follow manufacturer's directions).
2. Fumigate the incubator and trays with formaldehyde *(follow manufacturer's directions)*.
3. Start the incubator at least 72 hours before setting the eggs. This will give you time to make necessary adjustments.
4. Place gauze on the floor of hatching trays to provide chicks with adequate footing.

Operating the Incubator

Each incubator will have its own operating peculiarities. Learn these individual differences for success in hatching game bird eggs.

Most manufacturers specify recommended temperatures and humidity for their particular machine. A guide to follow for regulating incubator temperature, humidity, and time of incubation (if you do not have the manufacturer's directions) is shown in Table 1.

It is important to turn eggs periodically during the incubation period. In the nest, the hen performs this operation. While eggs are turned automatically through a time clock mechanism in modern large incubators, they must be turned by hand in smaller, or older, models. If hand-turned, record the turn or tilt of the egg. Otherwise, you might not remember whether turning was done. Hand turn 3 times a day—at 7:00 A.M., noon, and 7:00 P.M.

Brooding

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

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.

The following management details should be followed carefully to insure success:

1. Brood in a well-constructed, vermin-proof house.
2. Clean, disinfect and dry-out the brooder house well in advance of arrival of the chicks.
3. Add 1/2-inch of new, absorbent-type litter. Ranked in order of decreasing ability to absorb water, poultry litters include: (1) sugar cane, (2) corn cobs (dry, crushed), (3) peanut hulls, and (4) wood shavings.
4. Place a covering (should not be smooth since birds will slide on smooth surfaces) over the litter for the first week to prevent chicks from eating litter.
5. Turn on brooder stoves, or heat source, at least 48 hours before chicks are scheduled to arrive. Regulate temperature at chick height to 95°F. and reduce temperature 5°F. each week until the added heat is no longer needed. If 250-watt heat lamps are used for brooding, suspend the lights 36" above the floor. Brooding results will be better if the chicks have a choice of temperatures. They will move from hot (95°F.) to warm (85°F.) if they want to cool off during their first week.
6. 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 will, when properly adjusted, provide adequate ventilation.
7. Many production facilities have too many windows. Houses can also become too hot or too light. Cannibalism can be a problem under these conditions. One 40-watt light 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 to confine the birds to the house or yard, is usually enough open space in a small house. Fans work well in a large house.

When Chicks Arrive

1. Chicks should have water when they are placed under the heat source. 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.
2. Confine chicks for the first week in circular areas (about 6 feet in diameter) with 18-inch high cor-

Table 1. Forced-air Type Incubators.

Kind of Bird	Incubation Chamber		Hatching Chamber		Days In Incubation Chamber	Period In Hatching Chamber
	Temp. (°F.)	Humidity (%)	Temp. (°F.)	Humidity (%)		
Quail	99 3/4	60	99	85	1-19	After 19 days
Pheasants	99 3/4	60	99	85	1-20	After 20 days
Chukars (Partridge)	99 3/4	65	99	85	1-19	After 19 days

NOTE: Candle eggs when transferring to hatching chamber – dispose of infertile eggs and dead embryos at this time.

Figure 2. Incubating game bird eggs.

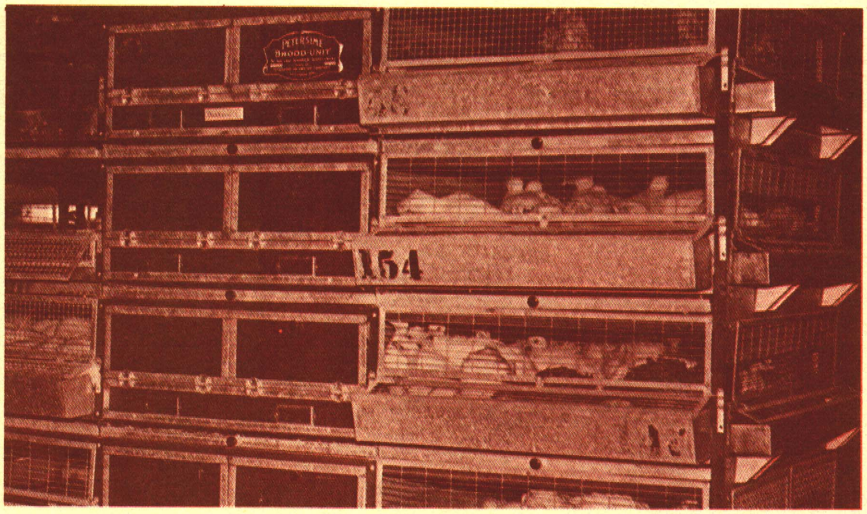

Figure 3. Battery brooding system.

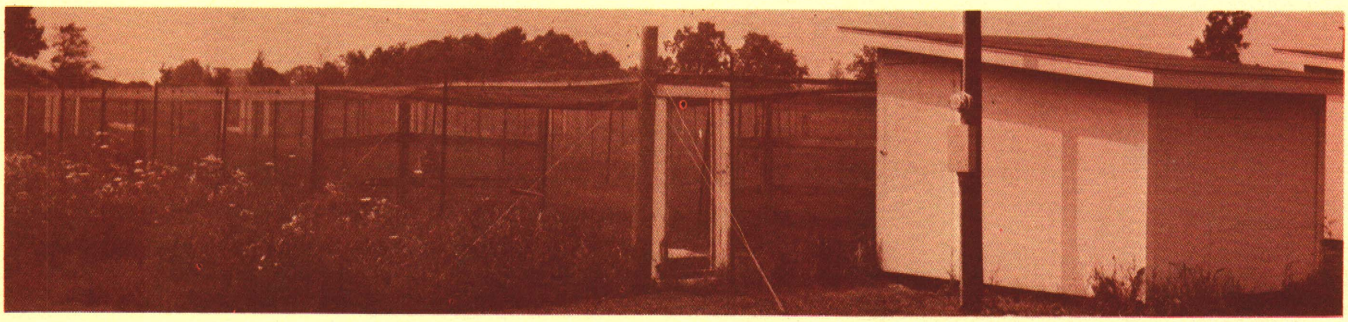

Figure 4. Portable brooder house with flight-pen attached.

Figure 5. Outdoor flight-pen for chicks. Note raised waterer and shade area.

Figure 6. Suggested brooding area to start birds. (Hover was raised to take picture.)

rugated chick guards. Remove both guards and floor covering over litter after one week.

3. Provide 1-linear inch of chick feeder space per chick and increase to 2 or 3-linear inches by the sixth week, depending on type of bird being brooded.
4. Provide two, 1-gallon fountains per 100 chicks and increase to two, 3-gallon fountains per 100 chicks by the sixth week. Place on wire platform to prevent water spillage in 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 is not careful. Keep feeders full the first week, three-quarters full the second week and no more than one-half full thereafter.

Raise feeders and waterers after first week to keep litter out of them. Bricks or 2'' x 4'' boards 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 more than 2'' high) will keep the birds out of damp litter usually present around the 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 (Starting and Growing)

Game bird and chicken nutrition differs in that game birds require a higher level of protein during early life. While high quality commercial game bird feeds are available through feed companies, a 28% protein turkey starter feed will usually provide well-balanced game bird nutrition.

Pigeons, for example, grow more rapidly than any other game bird in the first 20 days of life. They receive their first nourishment from pigeon milk from the parent pigeon's crop. After this period (20 to 40 days), they may be fed a 14% protein ration, composed of grains and Canadian peas with good results. Commercial pigeon feeds are available, or the fancier may prepare a suitable ration of grains, plus a free choice mineral mixture, as shown in Table 2.

Starter Feed

During the first five to six weeks of life, quail, chukars, partridges, and pheasants should receive only high protein starter feed (28% to 30%) with no additional grain feeding. For best results and least amount of feed wastage, the starter should be in mash form

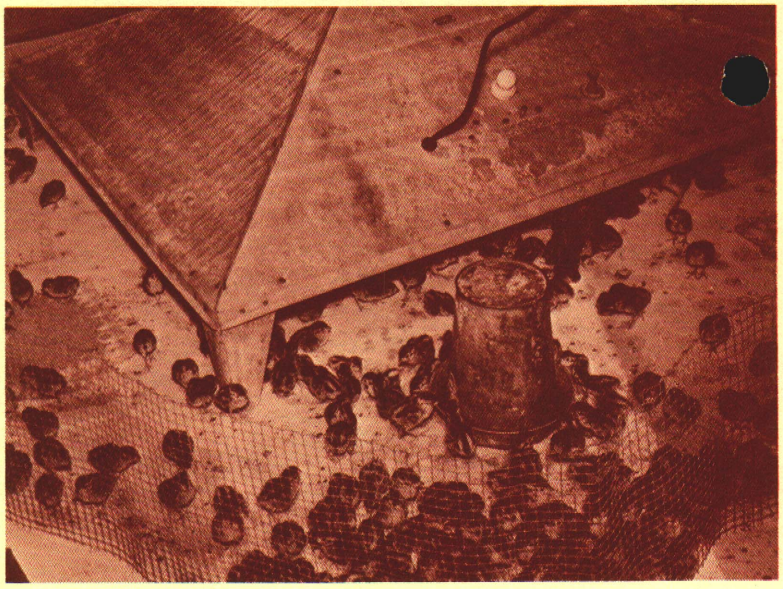

Figure 7. Inside view of portable brooding area.

the first two weeks, crumble form the second through the fourth week, and in the form of 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 will be cleaned up without wastage. When whole grain feeding is begun (and fed in combination with pellets) be sure to provide grit at all times in separate hoppers, if birds are confined to the brooder. **DON'T OVER FEED 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 evening.

Table 2. Suitable Rations and Mineral Mixture for Pigeon Feed.

Grain Mixture	Lbs.
Whole yellow corn	35
Kafir or milo	20
Cow peas (or) field peas	20
Hard red wheat	15
Oat Groats	5
Hempseed	5
	100

Mineral Mixture*	Lbs.
Medium-sized ground oyster shells	50
(Appropriate size grit)	25
Bone meal or dicalcium phosphate	20
Iodized salt	5
	100

*(feed in separate hoppers free-choice)

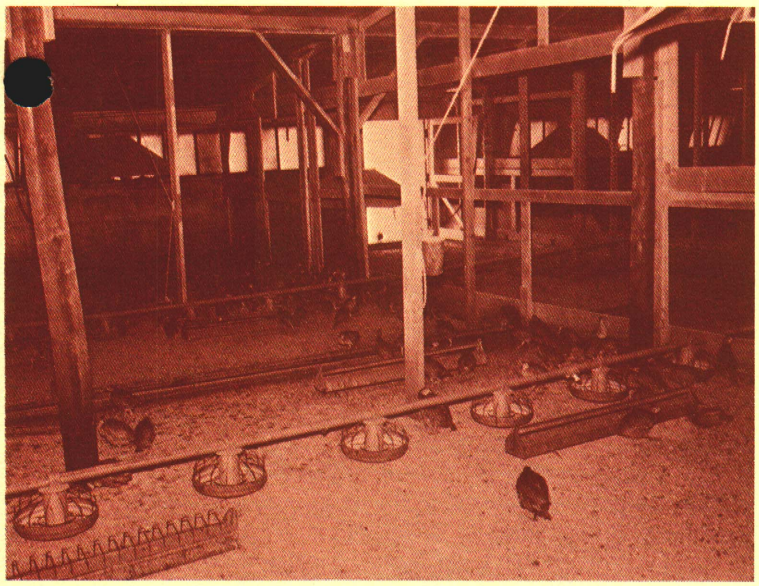

Figure 8. Confinement rearing with mechanical feeders and waterers.

Wet Mashes or Special Feeds

There is **no** good evidence that "wet mash" is as beneficial to game birds as dry feed. In addition to the extra labor required, wet feeds may spoil and cause harmful bacterial contamination. Wet feeds can also cling to toes and beaks, causing cannibalism.

Maintenance

After the twelfth week, protein and other nutrients in the ration can be reduced appreciably, since most of the early rapid growth is completed. The starter ration may be fed after the early critical growth period, but, should be combined with increasing amounts of corn. The maintenance ration shown in Table 3 would normally be fed after the thirteenth week until just before the breeding season.

A suggested feeding program for game birds follows:

Age of Birds	Whole Grain Feeding		Feed
Weeks	*Morning*	*Evening*	
0 — 5	-	-	Starter-Grower
6 — 9	-	+	Starter-Grower
10 — 14	+	+	Starter-Grower
Till 1 mo. before breeding	-	+	Maintenance Ration
From 1 mo. before breeding	-	-	Breeder Ration

Breeder Rations

Nutritional requirements for game birds change at breeding time. For good hatchability, high quality breeder rations must be fed. Breeding birds should be started on an all-mash or pelleted ration at least one month before the breeding season.

Table 3. Complete All-mash Rations for Game Birds.

Ingredient (Pounds)	Age of Birds 0 - 6 Weeks	7 - 12 Weeks	Maintenance[1]	Breeder[2]
	Pounds Per 1000 Pounds Feed			
Corn, yellow, medium grind	390	570	805	640
Alfalfa meal, dehy., 17% protein	30	25	20	50
Soybean meal, solvent 45% protein	425	290	120	130
Wheat middlings, standard	20	20	---	---
Corn distillers dried solubles	20	15	---	20
Meat & bone scraps, 50% protein	50	25	25	25
Whey, dried	20	10	---	20
Fish meal, 60% protein	25	20	---	50
Salt	5	5	5	5
Dicalcium phosphate	10	10	15	10
Limestone, ground	---	5	5	45
Vitamine-trace mineral premix[3]	2.5 or 5(1)	2.5 or 5(2)	2.5 or 5(2)	2.5 or 5(3)
TOTAL (lbs)	**1000**	**1000**	**1000**	**1000**
Approximate Analysis	**Starter**	**Grower**	**Finisher**	**Breeder**
Crude protein %	28.6	22.4	14.0	17.5
Crude fat %	2.6	2.9	3.2	3.4
Crude fiber %	4.9	4.3	3.7	3.9
Productive energy cal/lb.	787.0	894.0	994.0	919.0
Calcium %	1.1	0.9	0.9	2.6
Phosphorus %	1.0	0.8	0.7	0.8
Salt (added) %	0.25	0.25	0.25	0.25

[1]Maintenance: from 13 weeks till one month before breeding.
[2]Start feeding 4 wks. before collecting hatching eggs.
[3]See Table 4 for description of vitamin-trace mineral premixes. (Figure in parenthesis refers to column number in Table 4.)

For best results, the change from a maintenance feed to the breeder diet should be gradual over a five-day period. To change feeds, mix the two feeds together at first, then remove 25% of the maintenance-type 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 of other poultry, and in most instances, respond to the same treatment. Virulent disease micro-organisms can pass from bird to bird much more rapidly in confinement than in wild habitat. Biting insects, however, are a possible source of disease in our wild game bird population. It is difficult to find sick or dead game birds, since sick ones will not come out in the open and are usually well hidden by their plumage. Predatory animals usually account for those that die in the wilds. Thus, 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 may refer you to the State Poultry Pathologist.

Medication

During periods of stress (cold, wet weather or when moving birds) it may be advisable to feed a medicated ration (prior, during and after the stress), for a 5 to 7 day period. Feeds can be fortified with approximately 100 grams per ton of suitable antibiotic or furizolidone during such periods. Cost of these drugs at high levels is usually prohibitive if fed longer than 5 to 7 days.

Since game birds are subject to coccidiosis, it is **important** to include a coccidiostat in starting and growing feeds when birds are raised in confinement. Several effective coccidiostats are commercially available for game bird rations and should be fed according to directions. Water treatment with soluble sulfas can also be used with success.

Examples of typical starting, growing, maintenance, and breeder rations for game birds are shown in Table 3. Analysis of the vitamin-trace mineral premix suitable for game birds is shown in Table 4.

Vaccination

A game bird breeder with a large operation may decide to vaccinate for some of the diseases that infect commercial poultry farms. Vaccines are available for infectious bronchitis, newcastle and fowl pox. While most game birds are fairly resistant to these diseases, immunization may be wise when large quantities of birds are concentrated. Before this is done, it might be well to consult with the State Veterinarian's Office or the Poultry 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 invasions of disease organisms.

Sanitation

To many people, sanitation means disinfectants or use of antibiotic-like drugs. 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 equipment used for brooding and rearing game birds

Table 4. Vitamin-trace mineral premixes shown are available commercially in 5 or 10 pound packages. Each package will fortify one ton of complete feed.*

		(1)	(2)	(3)
Vitamin A	I.U./lb	400,000	300,000	500,000
Vitamin D	I.C.U./lb	200,000	100,000	200,000
Riboflavin	mg/lb	300	300	350
Pantothenic acid	mg/lb	300	400	300
Niacin	mg/lb	3,000	2,000	2,000
Choline	mg/lb	35,000	20,000	20,000
Penicilli	mg/lb	300	300	400
Vitamin E	I.U./lb	400	100	100
Vitamin B	mcgm/lb	600	400	400
Vitamin K	mg/lb	---	---	---
Manganese	mg/lb or %	5,450	5,450	5,450
Iron	mg/lb or %	1,810	1,810	1,810
Copper	mg/lb or %	181	181	181
Iodine	mg/lb or %	109	109	109
Zinc	mg/lb or %	---	---	---
Cobalt	mg/lb	---	---	---
BHT (anti-oxidant)	gm/lb	11.3	11.3	11.3

*The following companies have these or equivalent vitamin-trace mineral packs available:

Nopco Chemical Company, Harrison, New Jersey
Dawes Laboratories, 4800 S. Richmond Street, Chicago, Illinois
Peter Hand Company, 1000 North Avenue, Chicago, Illinois
Merck and Company, Rahway, New Jersey
Charles Pfizer and Company, Inc., Terre Haute, Indiana

must be soaked and scraped of dirt and droppings before the disinfectant can kill the remaining micro-organisms. Antibiotics help control certain respiratory and intestinal infections, but are not a substitute for good management which keeps birds clean, dry and properly fed. Drug costs can easily become prohibitive if used as a substitute for cleanliness and good planning.

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 long periods.

Game bird runs should be located on sandy loam soil with good slope for drainage. 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 to a fast-growing cover crop, such as rye. These practices will reduce disease and parasite problems considerably.

Quarantine

If older birds are brought on to 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 pads 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:

1. Recognize symptoms early.
2. Consult your local veterinarian. He may refer you to a poultry pathologist.
3. Follow his recommendations exactly.

This procedure can mean the difference between success or failure, since 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. Materials used to treat poultry diseases are usually successful on game birds. Dosage may need to be varied due to the small sizes of some of the game birds. Here are some of the common problems of confined game bird flocks.

Worms

Worms have been a problem in game bird production primarily when birds are grown on infected premises. It is almost impossible to keep fly pens and breeder yards free of worm infestations without a 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 hard to say that death is directly caused by

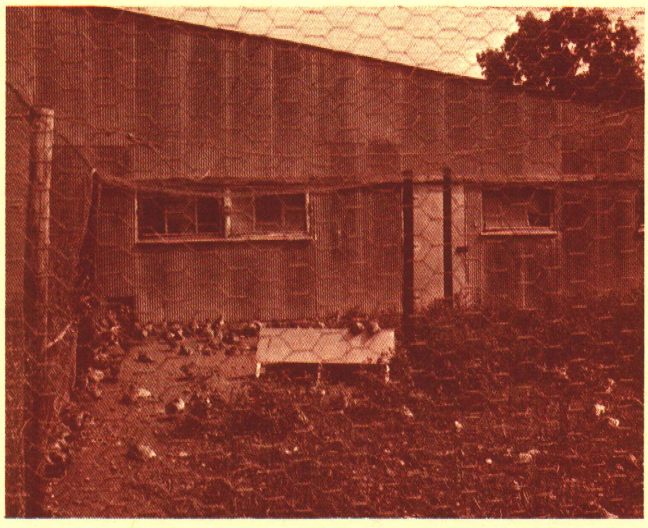

Figure 9. Outside flight-pen for growing birds.

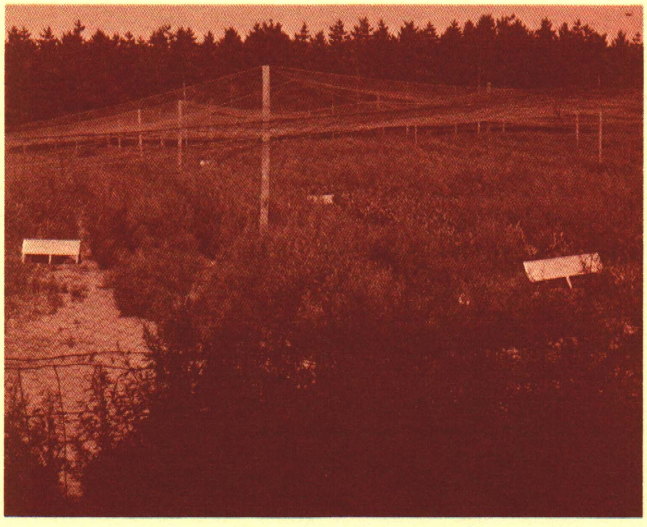

Figure 10. Flight-pen for mature birds.

Figure 11. Flight-pen for mature birds with artificial and natural cover.

worms. 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.

Round Worms

The round worm is usually 1 1/2'' to 3'' long and found in the small intestine. It is usually white or creamy in color and somewhat firm in texture. The life of the round worm is rather simple: the female round worm produces large numbers of eggs which can pass from an infected bird into droppings. If the temperature is 65° to 90°F. and relative humidity 60% to 90%, the eggs will reach an infective stage in approximately 10 days. If a bird swallows some of these infected eggs, it will develop round worms.

There are few symptoms in very light or mild infestations of round worms. In heavy infestations, birds become droopy and feathers are ruffled. They may have some diarrhea and weight loss. Sometimes, round worms are visible in the droppings.

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

Tapeworms

Tapeworms are also found in the small intestine. The tapeworm attaches its head to the intestine wall by means of suction cups and a hook-like beak. The rest of the worm is segmented, with the segments on the end of the worm becoming 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 picked up by an intermediate host. These hosts vary with the species of tapeworm (there are several different species), and include various insects, slugs, snails and earthworms. Game birds become infected with tapeworms by eating these hosts which have eaten the egg-filled segments.

Gapeworms

The gapeworm infects the game bird in the trachea by attaching itself to the trachea wall. The gapeworm may also be called redworm due to its somewhat reddish color. This is particularly true of the female gapeworm, which is darker red and much larger than the male (female is almost an inch in length). The male is permanently attached to the female, so that this worm is often called the ''Y'' worm, because they appear like the letter Y.

The gapeworm can be transmitted directly from the host bird to the uninfested bird through worm eggs in droppings. It can also be passed through an infected earthworm—which picked up the gapeworm larvae while feeding in contaminated soil.

After the eggs are shed by the female gapeworm into the trachea, they reach the mouth cavity of the infested bird. The eggs are then swallowed and passed through the bird into the droppings. Again, moisture and temperature conditions must be right for the worm eggs to mature.

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

Coccidiosis

Coccidiosis, one of the most wide-spread 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 protozoan). There are several strains or species of the disease, but they have a similar life cycle. They may affect different parts of the small intestine, however, controls are similar in all cases.

To control coccidiosis, it is well to know something about the life cycle of the coccidia. Eggs are passed out through the droppings of infected birds. The eggs are not infective when passed out of the bird, but require some 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 different infecting organisms.

These infecting organisms (sporozoites) invade the intestinal wall after they have been picked up by the game bird. Inside the intestinal wall, the sporozoites redivide many times—so that the cell wall becomes enlarged and ruptures. This allows the organisms to enter other cells in the intestinal wall and redivide to cause more cell walls to rupture. Thus, 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 has been called Bacillary White Diarrhea (BWD). It can be a very serious problem in chicks when allowed to go unchecked. It is also a disease of older birds, but generally not as serious.

Pullorum disease is transmitted through the egg to the chick. In the incubator, a few infected eggs can readily infect hatching chicks.

It can also spread in the breeder flock from hen to hen. The disease organisms can also be present in the litter, water or feed that has been contaminated by diseased chicks.

Disease Control

The control of worms and coccidiosis is greatly enhanced through good sanitation. 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 become 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 disease should be properly identified—then drugs can be prescribed. A local veterinarian or the State Veterinarian Office, Michigan Department

of Agriculture, Lewis Cass Building, Walnut Street, Lansing, Michigan, 48913, 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, which 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. However, since geneticists also select for so many other traits, they tend to neglect coccidiosis, since it becomes a complicating factor. They would like to see coccidiosis controlled through good sanitation or drugs.

External Parasites

Lice

Lice are one of the most wide-spread external parasites of birds. They cause skin irritation and leave infested birds restless. Heavy lice infestations can cause interference 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. However, some of the drugs that have been used on lice are no longer allowed. For the proper method of treatment, check with your county extension agriculture agent, the Entomology or Poultry Science Departments at Michigan State University, East Lansing.

Mites

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

The common red mite sucks the 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 cake manure.

The red mite can cause a serious problem from excessive blood loss in severe infestations.

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

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 sporatic 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 symptoms.

While it is normal for one or two of the larger birds to order some of the others around, particularly those in the lower part of the "peck order," this can lead to cannibalism. The social system of the flock is pretty well established or will be as soon as the birds get to know each other.

At the present time, cannibalism is thought to be caused by too much or too little of something — too much heat or light, over-crowding 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, check the feed that is available. Birds should have enough feeder space so 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 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 debeaking. However, debeaked birds are not as desirable in appearance. Debeaked birds have had the top beak cut off or removed about half-way from the tip to the nostrils. The bottom beak is removed about a quarter of the way from the tip to the nostrils. Poultry men use an electrically heated knife that cuts off and sears the beak at the same time to prevent bleeding. Chickens are debeaked at a very young age, usually in the first two weeks of life.

Cannibalism is also controlled through the use of specks. Specks look like reading glasses for the bird. They fit over the beak with a plastic pin attached through the nostril. The only way they differ from reading glasses is that they are blinders, made of 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.

Figure 12. Use of specks to help control cannibalism.

Assistance in Game Bird Production

Many people do not realize that there are many sources of information or assistance in game bird growing. 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 who are using their feeds.

Some periodicals available to assist in game bird management are: *Game Breeders Gazette,* 1328 Allen Park Drive, Salt Lake City, Utah, 48105; *Modern Game Breeding* (monthly), 300 Front Street, Boiling Springs, Pennsylvania, 17007; *The American Field,* 222 West Adam Street, Chicago, Illinois, 60606. Other sources of printed literature are: U.S. Department of Agriculture, Washington, D.C.; Michigan Department of Natural Resources, Game Division, State of Michigan, Lansing, Michigan 48926; Conservation Department, Olin Industries, East Alton, Illinois, 62024.

Licenses, 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. An importation permit must be purchased *before* game birds are shipped into Michigan. This prohibits the shipment of diseased or otherwise undesirable birds into this 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 upon request from the Game Division, Department of Natural Resources, State of Michigan, Lansing, Michigan, 48926.

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