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9 Hunting, Recreation, and Conservation

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Hunting, Recreation, and Conservation

*T*HERE can be little doubt that the grouse and quail provide the most important and most popular targets for more than ten million small-game hunters every year in North America (National survey, 1965). In much of the southeast, to go "bird" hunting simply means a day in pursuit of bobwhites, and likewise in New England "pa'tridge" hunting is regarded as the premier sport of all upland game hunting. These two species, the bobwhite and ruffed grouse, in 1970 were hunted in forty-seven states and eight provinces and are without question the most important of all North American upland game species (table 27). Although neither species was hunted during 1970 in Arizona or South Dakota, both have been legal game in South Dakota in recent years, and masked bobwhites originally occurred in southern Arizona, where they are now being restocked. In addition, the bobwhite occurs over much of Mexico and is an important game species in that country.

In table 27 is presented a list of the grouse and quail occurring north of Mexico, as well as the states and provinces in which they could legally be hunted during the 1970-71 hunting season, based on information available to the author. Of course, the length of the season and the daily limits varied greatly in different areas and in a few instances the total season lasted only a day or two. However, the list does provide a method of estimating the relative importance of the species as game. On this basis alone,

the ruffed grouse might be judged most important, while the bobwhite is almost as widely hunted. Other species that are currently hunted in ten or more states and provinces are the sage grouse, blue grouse, spruce grouse, sharp-tailed grouse, chukar partridge, and gray partridge.

TABLE 27
STATES AND PROVINCES WHERE GROUSE AND QUAIL
WERE LEGAL GAME IN 1970

Sage grouse:	California, Colorado, Idaho, Montana, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming, Alberta
Blue grouse:	Alaska, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming, Alberta, British Columbia
Spruce grouse:	Alaska, Idaho, Minnesota, Montana, Washington, Alberta, British Columbia, Manitoba, New Brunswick, Ontario, Quebec, Saskatchewan
Willow ptarmigan:	Alaska, Alberta, British Columbia, Manitoba, Newfoundland, Ontario, Quebec, Saskatchewan
Rock ptarmigan:	Alaska, British Columbia, Newfoundland, Quebec, Alberta, Manitoba, Ontario, Saskatchewan (rare to infrequent in last four provinces listed)
White-tailed ptarmigan:	Alaska, Colorado, Alberta, British Columbia
Ruffed grouse:	Alaska, California, Delaware, Georgia, Idaho, Illinois, Indiana, Iowa, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Montana, Nevada, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, Tennessee, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, Wyoming, Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland, Nova Scotia, Ontario, Prince Edward Island, Quebec, Saskatchewan
Prairie chicken:	Kansas (greater), Nebraska (greater), New Mexico (lesser), Oklahoma (both), South Dakota (greater), Texas (lesser)

TABLE 27 —(continued)

Sharp-tailed grouse:	Alaska, Colorado, Idaho, Michigan, Minnesota, Montana, Nebraska, North Dakota, South Dakota, Washington, Wisconsin, Wyoming, Alberta, British Columbia, Manitoba, Ontario, Quebec, Saskatchewan
Mountain quail:	California, Idaho, Nevada, Oregon, Washington, British Columbia
Scaled quail:	Arizona, Colorado, Kansas, Nevada, New Mexico, Oklahoma, Texas, Washington
Gambel quail:	Arizona, California, Colorado, Idaho, Nevada, New Mexico, Texas, Utah
California quail:	California, Idaho, Nevada, Oregon, Utah, Washington
Bobwhite:	Alabama, Colorado, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Vermont, Virginia, Washington, West Virginia, Wyoming, British Columbia, Ontario
Harlequin quail:	Arizona only. A few may be taken in New Mexico during the general quail season.
Gray partridge:	Idaho, Indiana, Iowa, Minnesota, Montana, Nevada, New York, North Dakota, Oregon, South Dakota, Utah, Washington, Wisconsin, Wyoming, Alberta, British Columbia, Manitoba, Nova Scotia, Ontario, Prince Edward Island, Quebec, Saskatchewan
Chukar partridge:	California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming, British Columbia

A more meaningful but much more difficult method of evaluating the sporting value of each species is to try to estimate the annual hunter kill for all the states and provinces in which it is legal game. Such estimates are regularly made by most but not all state and provincial game agencies, but since the techniques used for these estimates vary greatly, the accuracy of the estimates varies as well. Nevertheless, in the belief that an inexact estimate is better than none at all, I have attempted to gather annual hunter-kill estimates for all of the species concerned (table 28). In some cases these were derived from annual reports of the game agencies or from technical or semitechnical periodic publications of these agencies, while in others they represent unpublished estimates that are normally used for management purposes or other functions. Because of the diversity of origins of the data, these sources are not indicated in the table, and clearly the estimates should be regarded only as general ones, in spite of the fact that they are not usually rounded off to the nearest thousand. Wherever possible, I have used and averaged figures from a several-year period rather than listed the most recently available single-year's data, since, for grouse in particular, there tend to be major yearly variations in hunter success.

TABLE 28
SOME ESTIMATED RECENT STATE AND PROVINCE HARVESTS,
UNITED STATES AND CANADA

Alabama:	2,160,603 bobwhites in 1967.
Alaska:	Average harvests from 1952 to 1957 plus 1961, 93,971 ptarmigan, 59,306 total grouse (blue, spruce, ruffed, and sharp-tailed).
Arizona:	6,000 harlequin quail in 1969, average of 40 chukar partridges from 1962 to 1967, and 1,541,978 total other quail (scaled and Gambel) in 1968.
Arkansas:	400,000 bobwhites in 1967.
California:	3,200 sage grouse in 1969, average of 3,471 blue and ruffed grouse, 73,471 chukar partridges, and 2,432,557 quail (mountain, Gambel, and California) from 1963 to 1969.
Colorado:	1968 estimated kill of 13,107 sage grouse, 27,251 blue grouse, 3,382 white-tailed ptarmigan, 2,612 sharp-tailed grouse, 28,127 scaled quail, 4,469 chukar partridges, and 25,249 other quail (Gambel and bobwhite).

TABLE 28—(continued)

Connecticut:	No data on ruffed grouse; a few bobwhites (and released chukars) are killed annually.
Delaware:	No data (bobwhite only).
Florida:	2,500,000 bobwhites in 1968.
Georgia:	2,498,587 bobwhites in 1968. The annual ruffed grouse kill is about 2,500.
Idaho:	81,700 sage grouse and 105,600 forest grouse (spruce and ruffed) in 1969. In 1968, 110,000 total quail (mountain, Gambel, California, and bobwhite), and in 1969, 171,200 chukar partridges and 64,700 gray partridges.
Illinois:	Average of 2,020,840 bobwhites between 1958 and 1967; average of 9,716 gray partridges from 1961 to 1967.
Indiana:	911 ruffed grouse in 1966; 550,000 bobwhites in 1967; average of 6,960 gray partridges from 1963 to 1964.
Iowa:	720 ruffed grouse in 1968; 750,000 bobwhites in 1967. The annual gray partridge kill averages about 12,000.
Kansas:	46,000 greater prairie chickens in 1967; 3,000,000 scaled quail and bobwhites in 1968. No data on lesser prairie chicken (season closed between 1936 and 1969, 3-day season held in 1970).
Kentucky:	Average of 996,000 bobwhites from 1964 to 1967. The annual ruffed grouse kill is usually 30,000–35,000.
Louisiana:	700,000 bobwhites in 1968.
Maine:	273,033 total grouse (ruffed and spruce) in 1968. Ruffed grouse kill from 1955 to 1960 averaged 185,000.
Maryland:	No data (bobwhite and ruffed grouse).
Massachusetts:	12,936 bobwhites in 1962. Average yearly kill of ruffed grouse estimated at from 65,000 to 75,000.
Michigan:	Average kill of 356,000 ruffed grouse from 1955 to 1960. Sharp-tailed grouse harvest of less than 500 in recent years. No data on bobwhite, which is hunted in only a few counties.
Minnesota:	560,000 ruffed grouse in 1969; 8,833 gray partridges in 1966. No data on spruce grouse. Average sharp-tailed grouse harvest between 1965 and 1969 was 11,000 birds.
Mississippi:	1,250,000 bobwhites in 1967.

TABLE 28—(continued)

Missouri:	2,810,000 bobwhites in 1967.
Montana:	Average harvests between 1964 and 1968 were: sage grouse, 48,964; blue grouse, 53,441; spruce grouse, 33,227; ruffed grouse, 56,408; sharp-tailed grouse, 88,067; chukar partridge, 3,235; gray partridge, 93,717.
Nebraska:	49,000 prairie grouse (pinnated and sharp-tail) in 1969. An estimated total of 15,000 pinnated grouse were taken in 1967.
Nevada:	In 1967 the estimated harvest was 7,300 sage grouse, 408 blue grouse, 49,000 chukar partridges (including some gray partridges), and 72,898 total quail (mountain, Gambel, and California).
New Hampshire:	No data (ruffed grouse only).
New Jersey:	110,000 ruffed grouse and 111,000 bobwhites in 1969.
New Mexico:	Between 1958 and 1968 the average harvest was 1,700 blue grouse, 1,100 pinnated grouse, and 202,000 total quail, including an estimated 162,000 scaled, 36,000 Gambel, and 4,000 bobwhites.
New York:	Average harvest of 409,450 ruffed grouse between 1966 and 1969. No data on bobwhites or gray partridges.
North Carolina:	63,043 ruffed grouse in 1964; 2,500,000 bobwhites in 1968.
North Dakota:	Sage grouse harvest in 1964 was 100–200 birds. In 1969 the harvest was 5,014 ruffed grouse, 109,255 sharp-tailed grouse, and 69,142 gray partridges.
Ohio:	16,600 bobwhites in 1969; annual ruffed grouse kill estimated to be about 5,000. No recent data on gray partridges, but harvest probably less than in 1959, when 5,400 were taken.
Oklahoma:	Average pinnated grouse harvest from 1959 through 1968 was 7,700. In 1968, 3,326,000 scaled quail and bobwhites were harvested, of which an estimated 3,000,000 were bobwhites.
Oregon:	1968 sage grouse harvest was 51,700 and forest grouse (blue, spruce, and ruffed) harvest was 143,300. Blue grouse harvest estimated at 24,476 in 1960. The 1968 total quail

TABLE 28—(continued)

	harvest (mountain, California, and bobwhite) was 216,638, plus 123,000 chukar partridges and 72,500 gray partridges.
Pennsylvania:	1969 harvest was 25,000 bobwhites and 280,000 ruffed grouse.
Rhode Island:	Average harvest from 1958 through 1959 was 290 bobwhites and 530 ruffed grouse.
South Carolina:	1968 harvest was 2,500,000 bobwhites. The annual ruffed grouse kill is only 100 to 250 birds.
South Dakota:	1969 harvest was 95,000 prairie grouse and 7,500 gray partridges. In 1967 the pinnated grouse kill was estimated to be 10,000. Sage grouse harvest in 1966 and 1967 about 2,000 birds. Bobwhite harvest 500 in 1959.
Tennessee:	1968 harvest of 1,700,000 bobwhites. The annual ruffed grouse kill is about 15,000 birds.
Texas:	1968 harvest of 8,000,000 bobwhites and 2,000,000 scaled quail. No data on Gambel quail. Average annual lesser prairie chicken harvest from 1965 through 1969 was 275 birds.
Utah:	1967 harvest included 5,089 sage grouse, 17,527 forest grouse (blue and ruffed), 26,187 quail (Gambel and California), 48,906 chukar partridges, and 16,049 gray partridges.
Vermont:	No data (ruffed grouse only).
Virginia:	1,380,405 bobwhites in 1968. The annual ruffed grouse kill is about 85,000 birds in good years.
Washington:	Average harvests from 1964 through 1969 include 2,483 sage grouse, 162,400 blue grouse, 16,744 spruce grouse, 162,400 ruffed grouse, 113,551 chukar partridges, 25,100 gray partridges, 220,000 California quail, and a few hundred mountain quail, scaled quail, and bobwhites.
West Virginia:	1969 harvest was 66,000 bobwhites and 115,000 ruffed grouse.
Wisconsin:	289,960 ruffed grouse in 1969. Average gray partridge harvest between 1964 and 1968 was 31,835. No data on sharp-tail kill (season closed from 1965 through 1967).
Wyoming:	Sage grouse harvest from 1960 through 1969 averaged

TABLE 28—(continued)

	53,387 and forest grouse (blue, spruce, and ruffed) kill averaged 4,193 from 1964 through 1969. Sharp-tail kill from 1967 through 1969 averaged 739. Average 1960-69 harvest of 15,036 chukar partridges and 2,616 gray partridges. Bobwhite kill unknown but very limited.
Alberta:	Sage grouse harvest 272 in 1967; blue grouse harvest about 100 in 1960; ruffed grouse harvest averaged 52,795 between 1950 and 1956; sharp-tail harvest averaged 122,000 in 1966 and 1967. Gray partridge harvest averaged 104,985 between 1950 and 1956.
British Columbia:	Average harvests between 1964 and 1968 were 132,030 blue grouse, 133,362 spruce grouse, 361,293 ruffed grouse, 21,365 sharp-tailed grouse, 7,641 chukar partridges, and 13,352 quail (mountain and California).
Manitoba:	Average harvests between 1964 and 1969 were 14,922 spruce grouse, 9,709 ptarmigan, 56,973 ruffed grouse, 55,484 sharp-tailed grouse, and 6,265 gray partridges.
New Brunswick:	No data available.
Newfoundland:	From 25,000 to 50,000 ptarmigan are harvested annually, and since 1968 a small number of ruffed grouse have also been harvested. No data available from Labrador.
Nova Scotia:	The annual kill of ruffed grouse ranges from 50,000 to 65,000, and from 1,500 to 2,500 gray partridges are also harvested.
Ontario:	No data available.
Prince Edward Island:	About 500 ruffed grouse are taken annually.
Quebec:	No detailed estimates for any species (ptarmigan, ruffed grouse, spruce grouse, gray partridge), but annual grouse kill may approach 100,000 birds, since over 35,000 small game licenses were sold in 1969.
Saskatchewan:	Average harvests between 1962 and 1969 were 8,579 spruce grouse, 30,400 ruffed grouse, 129,000 sharp-tailed grouse, and 132,475 gray partridges.

By taking these individual state and provincial harvest figures and summing them by species (prorating totals in cases where several species were grouped together), it is possible to make a very tentative total annual harvest estimate for each species (table 29). These totals suffer from the fact that harvest data were not available to me from four of the smaller eastern states, two provinces, and the two Canadian territories. Nevertheless, with these numerous limitations in mind, a relative measurement of each species' probable hunting importance is possible. If these figures can be accepted, it would appear that nearly fifty million grouse, quail, and partridges are harvested every year in the United States and Canada, of which about 70 percent are bobwhites. Other quail which are clearly harvested in large numbers are the scaled, Gambel, and California quails. Not surprisingly, the ruffed grouse is the species with the largest estimated total hunter harvest, comprising nearly 70 percent of the total estimated grouse harvest of over five million birds.

It is of some interest that the chukar partridge and gray partridge now provide sport for hunters in sixteen states and eight provinces, and probably more than a million birds are now harvested annually. Indeed, in terms

TABLE 29
RELATIVE HUNTING IMPORTANCE OF GROUSE AND QUAIL SPECIES,
UNITED STATES AND CANADA

	<i>Open Season in 1970</i>			<i>Estimated Annual Kill</i>		
	<i>States</i>	<i>Provinces</i>	<i>Total</i>	<i>States</i>	<i>Provinces</i>	<i>Total</i>
Sage grouse	10	1	11	250,000	few	250,000
Blue grouse	11	2	13	240,000	130,000	370,000
Spruce grouse	5	7	12	140,000	300,000	440,000
Ptarmigans	2	7	9	100,000	200,000	300,000
Ruffed grouse	33	10	43	2,700,000	1,000,000	3,700,000
Prairie chicken	6	0	6	85,000	0	85,000
Sharp-tailed grouse	12	6	18	255,000	200,000	455,000
Mountain quail	5	1	6	375,000	few	375,000
Scaled quail	8	0	8	3,600,000	0	3,600,000
Gambel quail	8	0	8	1,300,000	0	1,300,000
California quail	6	1	7	2,200,000	few	2,200,000
Bobwhite	37	2	39	35,000,000	few	35,000,000
Harlequin quail	1	0	1	6,000	0	6,000
Chukar partridge	9	1	10	650,000	8,000	658,000
Gray partridge	14	8	22	400,000	250,000	650,000
Totals				47,301,000	2,088,000	49,389,000

of numbers of states and provinces where it can be legally hunted, the gray partridge now ranks third (behind the ruffed grouse and bobwhite) among the most important sporting birds of this group.

Assuming that most of the ten million or more small-game hunters in the United States spend part of their time hunting grouse, quail, or partridge species and that nearly fifty million of the birds are harvested here yearly, then the average season kill per hunter is approximately five birds. For most species, this is no more than a single day's limit of birds. This fairly reasonable estimate would suggest that the estimated total nationwide kill may not be very far from the actual number and may indeed be conservative. The economic value of this harvest, in terms of dollars spent in pursuit of the sport, is even more difficult to judge, but on the basis of average expenditure figures provided by the National Survey of Fishing and Hunting it must probably amount to more than six hundred million dollars per year.

It is, of course, impossible to place a dollar value on any living creature; and the grouse and quail present a special esthetic quality for lovers of nature. Leopold (1949) beautifully stated this view as follows: "Everybody knows that the autumn landscape in the north woods is the land, plus a red maple, plus a ruffed grouse. In terms of conventional physics the grouse represents only a millionth of either the mass or the energy of an acre. Yet, subtract the grouse and the whole thing is dead."

Thus, the value of the grouse and quail to bird watchers is real, and, indeed, to this group perhaps the birds are at least as valuable as they might seem to hunters. To many people, the first bobwhite whistle is not only the harbinger of spring, it *is* the spring. To others, the muffled drum roll of ruffed grouse in a distant glade is anticipated as eagerly as the earliest hepatica blossom, and on the midwestern prairies the vernal predawn booming of prairie chickens at their ancestral leks is as rich a heritage as the big bluestem and Indian grass that then lie golden in the swales.

To be individually appreciated by humans, grouse and quail must first be seen. This is not to say that a white-tailed ptarmigan on an inaccessible mountain peak that has yet to be climbed is any the less valuable than the California quail that make their daily jaunts to a back-yard feeding station and can be observed from a living-room easy chair. To many, in fact, a ptarmigan on a mountain meadow, surrounded by dwarf alpine flowers and framed by a glacial cirque, is the very essence of the American wilderness and represents an esthetic value beyond measure. But for the average American, tied to a city job during the week and enclosed by a concrete jungle of maddening noise and confusion, there is a special attraction in being able to drive a few miles into the country in the hope of catch-

ing a glimpse of the local wildlife. To obtain some measurement of this relative accessibility of the grouse and quail to American bird watchers, I have extracted data from the annual Audubon Society Christmas counts, the distribution of which reflects in some measure the distribution of people in the country and their relative bird watching opportunities. For the twelve years from 1957 through 1968 I have tabulated (table 30) the number of years the various species of grouse, quail, and partridges have been reported by at least one party; the average number of birds seen on the highest yearly counts (excluding years when the species was not seen at all); and the highest individual count during the entire twelve-year period. For the years 1957 through 1962 (later summaries of this nature were not compiled), the average count of each species seen in all stations where the bird was reported at all has been calculated, providing a rough index to the population density and perhaps also to the relative sociality of each

TABLE 30
GROUSE AND QUAILS REPORTED ON AUDUBON CHRISTMAS COUNTS, 1957-1968

	1957-1968			1957-1962	
	<i>Years Reported</i>	<i>Average High Count</i>	<i>Highest Count</i>	<i>Average Count per Station*</i>	<i>Average No. Stations</i>
Sage grouse	9/12	28.8	97	10.3	1.3
Blue grouse	10/12	3.4	14	3.4	2.3
Spruce grouse	7/12	3.6	8	3.0	7.3
Ruffed grouse	12/12	56.0	91	5.4	145.0
Willow ptarmigan	6/12	8.5	29	3.0	0.2
White-tailed ptarmigan	8/12	6.9	28	2.0	0.8
Rock ptarmigan	1/12	11.0	11
Sharp-tailed grouse	12/12	94.8	158	20.8	11.6
Greater prairie chicken	11/12	42.4	95	17.2	4.8
Lesser prairie chicken	5/12	144.0	443	48.0	0.2
Mountain quail	12/12	27.0	62	8.7	3.8
Elegant quail	1/12	5.0	5
Scaled quail	12/12	341.1	769	66.8	16.5
Gambel quail	12/12	370.3	725	57.1	12.6
California quail	12/12	1346.0	6854	179.3	41.0
Bobwhite	12/12	421.6	655	39.9	227.0
Harlequin quail	9/12	22.1	55	10.0	0.2
Chukar partridge	12/12	25.9	123	14.1	1.3
Gray partridge	12/12	266.4	552	28.6	25.5

*Excluding stations not reporting species

species. From these figures it may be seen that the bobwhite is the species most often encountered by American bird watchers in wintertime, with the ruffed grouse in second place and the California quail third. On the other hand, the great sociality of the California quail during winter and its consequently large covey sizes cause it to attain first place in average yearly high count among all stations recording it, the highest average count per station, and the highest individual count of any single station. The scaled, Gambel, and bobwhite quails also exhibit relatively high numbers of birds counted per station, which likewise reflects their covey-forming tendencies.

The other side of the coin is provided by the remaining forest grouse, sage grouse, prairie grouse, and ptarmigans, all of which were recorded by relatively few Christmas count groups, and generally were found only in small numbers. These species have a kind of "rarity appeal" that adds to their attractiveness for winter bird watchers, and their appearance on a daily check-list provides ample testimony to the effort expended in locating the birds. I personally can vividly recall snowshoeing across seemingly endless snow-covered fields of eastern North Dakota on one December day with a temperature of seven degrees below zero, in hopes of flushing a covey of gray partridge to add to the Christmas count.

Both hunters and nonhunting nature lovers can wholeheartedly agree to the need for conserving our irreplaceable grouse and quail. Perhaps too often the nonhunter might accuse the upland game sportsmen of "killing off our quail," or whatever the species concerned might be. With the present controls on hunting this is, of course, utter nonsense; every species included in this book has a relatively high reproductive rate associated with a comparable mortality rate, and under most circumstances hunting cannot measurably alter the mortality rate of the species. Far more important than the number of birds shot during the fall hunting season is the amount of winter food and cover available to support the survivors until the following breeding season. Except in rare circumstances, it is the simple presence or absence of adequate cover to provide the species' daily and annual needs that will determine whether or not a wild species can survive and prosper in an area. Unlike the situation with our migratory waterfowl, we cannot blame the people living somewhere else when our upland game populations diminish; the local environment is the critical factor in the success of upland game populations. In most cases this does not necessarily mean the retention of large wilderness areas. Bobwhites thrive on the "edge effect" produced by an interspersion of cultivated and uncultivated lands; and ruffed grouse benefit from local burning or cutting of too dense forests. What is serious, however, is widespread habitat disturbance or destruction during the nesting or brooding season or the reduction of adequate winter food

and cover so that the birds are forced into marginal habitats and increasingly exposed to the elements and to predators.

We have only recently become fully aware of another threat to our wild populations that is unrelated to cover, hunting pressure, or any other of the classic concerns of game biologists. This is the threat of pesticides and their insidious ability to permeate the natural environment before we are really aware of the enormous damage that they might do. These particularly include the "hard" or persistent insecticides such as the chlorinated hydrocarbons which can remain in soils and living tissues for great lengths of time, becoming increasingly concentrated as they are passed progressively up the food chain. Since the grouse and quail feed primarily on plant material as well as some insects, they do not suffer from this "biological magnification" to the degree that is true of various predators, fish-eating species and the like. However, they do store materials such as DDT in their body fats, and not only might these materials cause physiological damage during times of fat utilization but also they may be passed on to human consumers or predators. So far, DDT levels high enough to affect eggshell thickness and, as a result, reduce hatchability have not been detected in either the grouse or the quail of North America. We need not compliment ourselves on this circumstance, however; sufficient damage has been done by DDT to our fish-eating birds and other avian predators such as the falcons to justifiably indict the pesticide industry and its apologists for a disaster of unprecedented magnitude.

Environmental pollutants of greater immediate threat to upland game birds are the organic mercury fungicides used for treatment of seed wheat and other grains. Since small grains are a major food source for prairie grouse, quail, partridges, and pheasants in the Great Plains states, the birds are likely to ingest considerable amounts of the fungicide when they consume treated grain. In the fall of 1969 the Alberta Department of Lands and Forests found it necessary to close the hunting season on pheasants and gray partridges because of the concentrations of mercury found in these birds, and the Montana Fish and Game Department similarly found sufficient concentrations of mercury to cause them to caution hunters against eating the birds. Unlike DDT, mercury poisoning is produced by far smaller concentrations and it operates directly on the central nervous system. The physiological effects of DDT on vertebrates are far less localized and a wide variety of organ systems and physiological processes are disrupted. The first case of closing a game bird season because of dangerous DDT levels in a game bird species occurred in 1970, when New Brunswick closed its season on woodcock.

This is a sad period in the history of North America for lovers of wildlife

and the outdoors. We are witnessing the progressive extirpation of the greater prairie chicken from one state after another, and we must soon face the possibility that both the Attwater prairie chicken and the lesser prairie chicken will join the heath hen in the shadows of extinction. It also seems unlikely that the magnificent sage grouse will be able to withstand indefinitely the combined onslaughts of sage clearing and sage destruction through herbicide spraying, and it will be fortunate to survive the rest of this century. In Mexico, the fate of the tree quails and the spotted wood quail will become questionable as the cloud forests are progressively ravaged and the previously impregnable and mahogany-rich rain forests of eastern Chiapas are ripped apart by bulldozers, trucks and chain saws. A few short-term advances have been made and are properly rejoiced in, such as the establishment of several grassland refuges for prairie chickens, while at the same time the tide of increasing population and its associated degradation of our natural environment silently inches ever higher and begins to threaten our own survival.

We are not separate from our environment; each species we destroy and each habitat we ravage, whether by bulldozer or pesticides, represents one more bridge that we have burned in our own ultimate battle for survival. It is a melancholy thought that, after its compatriots had disappeared, the last surviving male heath hen in North America faithfully returned each spring to its traditional mating ground on Martha's Vineyard, Massachusetts, where it displayed alone to an unhearing and unseeing world. Finally, in the fall of 1931 it too disappeared. With it died the unique genes that reflected the sum total of the species' history, from Pleistocene times or earlier through uncounted generations of successful survival to the very last, when inbreeding, habitat disruption, fire, and disease inexorably tipped the balance of survival a final time. No one knows exactly how or when that last survivor died, and no bells tolled to mourn its passing. Indeed, only by the absence of its dirge-like booming the following spring was the heath hen's extinction finally established, and the bird that had been as much a part of our New England history as the Pilgrims was irrevocably lost.