THE MOURNING DOVE

IN MINNESOTA

1980

Minnesota Department

of Natural Resources

Division of Fish and Wildlife

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The mourning dove (Zenaida macroura) is one of the most abundant and well-known birds in Minnesota. During the past 25 years, a considerable amount of information on dove ecology and management has been accumulated. Since these data are not well-publicized, this report will provide a useful reference on the species.

TAXONOMY

The mourning dove is a member of the pigeon family -- the family Columbidae in the Order Columbiformes. The only other regular member of that family in Minnesota is the common pigeon, or rock dove (Columba livia). There is technically no distinction between "pigeons" and "doves" (Goodwin 1977). Although mourning doves have a characteristic cooing call and are sometimes referred to as "songbirds," ornithologically speaking they are not true songbirds. True songbirds are comprised of another group of birds in the suborder "oscines" within the Order Passeriformes. The oscines have evolved the most highly complex songs because the syrinx, or voice box, has from 5 to 8 muscles inserted into it. All other birds have 4 or fewer syrinx muscles. Examples of true songbirds are the house wren, brown thrasher, northern oriole, western meadowlark and cardinal (Austin 1961).

PHYSICAL CHARACTERISTICS

The streamlined dove has a small head and long pointed tail with a total length of 11 to 13 inches. The body is slate blue above and reddish-fawn below, with large white spots on the tail. It has a black spot behind the eye, a black bill and red legs and feet. An adult male can be distinguished

in hand by its light blue crown and nape and rosy breast feathers. The adult female has a brownish crown and nape and tan or brownish breast feathers. Immature doves are characterized by white or buff colored edging on the wing coverts (Keeler 1977).

In Minnesota the average weight of 10 adult mourning doves reported by D. Warner (pers. comm.) was 123 grams (4.3 ounces). In Illinois 549 juvenile mourning doves averaged 110 grams (3.9 ounces) (Hanson and Kossack 1963).

Mourning doves typically fly at 30 to 40 miles per hour, but can reach speeds of 55 miles per hour (Bastin 1952).

LIFE HISTORY

Food Habits

Mourning doves' legs are not strongly developed for walking. Therefore, their feeding activity must be limited mainly to areas with sparse ground cover. Seeds most commonly eaten in Illinois were foxtail grass (Setaria spp.), spurges (Euphorbia spp.), crab grass (Digitaria spp.), panic-grass (Panicum spp.), croton (Croton spp.), and lesser ragweed (Ambrosia artemisiifolia). The most important food for doves in southwest Iowa was wild hemp (Cannabis sativa) (Hanson and Kossack 1963).

Important grains eaten by mourning doves are corn, wheat, milo and sunflowers. Typically these grains are not used until seeds have dropped to the ground during harvest. In Minnesota wheat and sunflowers become increasingly important in late summer.

Nesting Habitat

Mourning doves nest in a wide variety of habitats. Although most nests are in trees, ground nesting in grasslands and grain fields is not uncommon. In Colorado, researchers found 247 nests in shelterbelts, 21 nests in grasslands, 3 nests in wheat fields, and 1 nest in a cornfield (Love 1980).

Usually nesting habitat consists of open and semi-open agricultural regions, brushlands, woodlands, and residential and urban areas. In open agricultural country the preferred nesting cover is shelterbelts, groves, and field windbreaks (Harris et al. 1963, Faanes 1977, Keeler 1977).

According to Harris et al. (1963), factors which influenced the selection of nest trees were density of cover, availability of horizontal limbs or crotches, proximity to tall perch sites, and proximity to an open view and/or flight path. Spruce trees in shelterbelts were preferred nesting locations at Madelia, Minnesota. In open areas, nearly 75% of all nests were located on the southwest, south, southeast, or east sides of the trees. In block plantings, doves usually nested near the edges of the planting and on the sides of trees that faced edges.

An average of 21 doves per acre were produced annually in a jack pine plantation at Prairie Island, Minnesota (Faanes 1977). At Madelia, Minnesota, a 1.1 acre, 20-year-old spruce shelterbelt produced 92 and 172 young per acre during two years of study. Considering all woody cover in the Madelia study area (5.6 acres), the production was 38 and 65 young per acre during the two years of research. If the entire farm, including cropland, at Madelia is considered (160 acres), the production was 1.3 and 2.4 young per acre for the two years.

Reproductive Ecology

In Minnesota, mourning dove pairs usually begin nesting activity in May and attempt to raise three broods each summer (Harris et al. 1963). Since nests usually contain 2 eggs, the potential exists for raising 6 young per pair per year. However, Harris et al. (1963) reported that each pair of doves averaged from 3.2 to 4.0 fledglings per year. Faanes (1977) reported a net reproductive level of 2.93 young per pair. Therefore, a pair of doves in Minnesota raises about 3.3 doves per season. According to Rice and Lovrien (1974) in South

Dakota, 2.6 doves per pair must be produced each season to maintain a stable population.

About 30 days are required to complete one nesting cycle. Eggs are laid over a 2-3 day period, incubation takes about 14 days, and fledglings spend about 12 days in the nest (U.S. Fish and Wildlife Service 1979). Separate peaks of nesting activity occur in June, July, and August. Some juvenile doves may then breed in their first summer (Smith 1978).

Faanes (1977) reported the latest date that a Minnesota fledgling left a nest was September 4. In Illinois, some nesting can actually occur until early October. The addition to the annual dove population from such September and October nesting is insignificant (Hanson and Kossack 1963). Preno and Labisky (1971) found less than 2% of the nesting effort by doves in Illinois occurred after September 1.

Nestling doves are fed a nutritious substance called "pigeon's milk." Both parents slough off a creamy material from their crop linings which they regurgitate for the young. Squabs stick their bills into the throats of the parents to be fed. In later stages, the young are fed half-digested grain from the parents' crops (Austin 1961).

Migration

In Minnesota, the spring mourning dove migration occurs from early March through late April (Green and Janssen 1975). As summer progresses, immature doves and non-breeding adults form large flocks in the vicinity of fallow fields, small grain, and sunflower fields (Smith 1978). Large dove flocks are conspicuous in Illinois as early as mid-July (Preno and Labisky 1971).

Mourning doves are relatively sedentary during most of the spring and early summer, but exhibit migratory restlessness and wildness when flocking in late summer (Hanson and Kossack 1963). This restlessness is an outward

manifestation of a physiological condition called "Zugunruhe." This is the physiological state of readiness to migrate.

The stimulus which initiates migration is a drop in temperature in late August or early September. Preno and Labisky (1971) concisely stated this relationship: "Few birds are as obviously sensitive to ambient temperatures in their migratory response as the mourning dove. Any modestly detectable drop in environmental temperature after mid-August may push the majority of doves southward from northern Illinois." Most doves leave Minnesota by mid-September.

Wintering Areas

Minnesota's mourning doves winter in at least 16 states plus Mexico, Guatemala, El Salvador, Nicaragua, and Costa Rica (Green and Janssen 1975, U. S. Fish and Wildlife Service banding recoveries 1967-1974). This wintering range was determined by the banding of 25,372 mourning doves in Minnesota from 1967 to 1974. Banding was carried out by Department of Natural Resources' personnel, federal banding permittees, and U.S. Fish and Wildlife Service refuge managers and game agents from 1 June to 31 August each year (Kopischke 1971, 1972, 1973, 1974). At Morris, 2,130 doves were trapped at one site in 1973.

Thus far 444 bands have been recovered from outside Minnesota (Fig. 1). Texas was the main recovery area, with 38.5%. Mexico accounted for 30.4%, and Louisiana for 7.9% of all recoveries. Therefore, these three areas were the source of over three-fourths of all banding recoveries, suggesting their relative importance as wintering areas. The percentage of recoveries in Texas may overestimate the actual value of Texas as a wintering area since some doves recovered there may have been en route to Mexico. Mourning doves are hunted during the fall throughout their main wintering range and most band returns are the result of hunter harvest. Although some doves winter in southern Minnesota and probably in Iowa, these areas are actually north of the main wintering range of the species (Green and Janssen 1975, Keeler 1977).

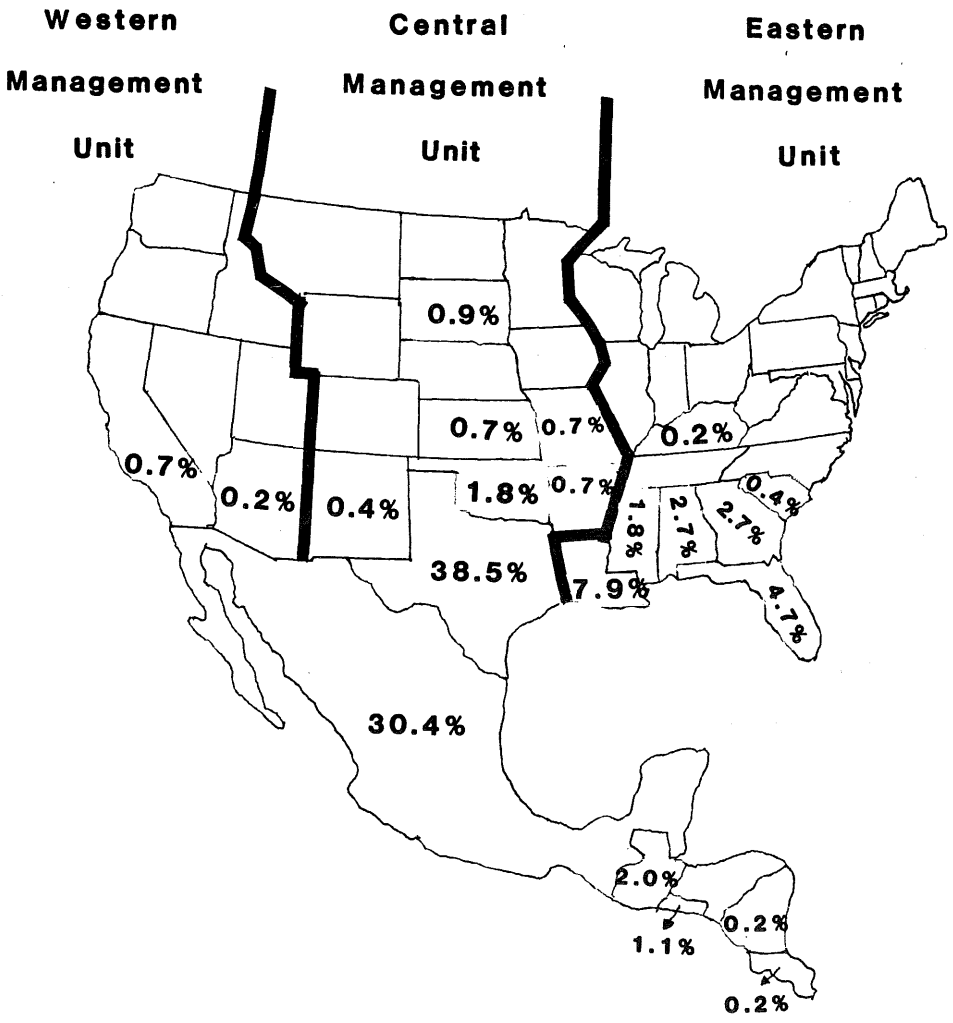

Figure 1. Out-of-state band recoveries for mourning doves banded in Minnesota from 1967-1974, expressed as a percent of all returns.

Egg and Nestling Mortality

High egg and nestling mortality rates are characteristic of mourning dove populations. In a Minnesota study, 37.3% of all eggs and 9.2% of all nestlings were lost (Harris et al. 1963). The most important causes of loss were predation and disappearance, nest desertion, and weather. Nest predators included common grackles, house cats, blue jays, striped skunks, weasels, fox squirrels, and screech owls. House cats and common grackles were the most important nest predators. The percentage of nests in which at least one young was raised was 64.8 at Madelia (Harris et al. 1963) and 49.4 at Prairie Island (Faanes 1977). In Colorado,

Olson found ground nests were more successful than nests in shelterbelts (Love 1980). Ground nests were 47.1% and 50.0% successful in 1978 and 1979, respectively. Shelterbelt nests were 45.5 and 28.2% successful during the same period.

September dove hunting seasons have recently been studied as one possible source of egg and nestling mortality. If doves with nestling young are shot, the young could be left to die. A study by George and Wooley (1980) in Iowa determined the daily mortality rate of eggs and nestlings in Iowa and other northern states to see if there was a difference in survival between hunting and non-hunting states. The U. S. Fish and Wildlife Service concluded after two years of this study that there is no evidence that the survival rates of dove eggs and nestlings are reduced in areas where September hunting is allowed. Apparently nesting adults are less vulnerable to hunting (Smith 1978). Actively nesting doves avoid large feeding flocks. This reduces their exposure to hunting activity which is typically concentrated on "summer flocking" doves in grain fields and at water holes. Once nestlings reach an age of six to eight days, they can be raised by a single parent.

Trichomoniasis is another source of nestling mortality. Also called canker disease, this disease organism lives in the digestive tract of adults and is transmitted to squabs during feeding (Allen 1972, Madson 1978).

Usually, weather is the most significant cause of egg and nestling mortality. La Perriere (1972) determined that May dove call counts in Iowa were strongly correlated with the amount of rainfall which occurred in the previous June and July. Increased rainfall resulted in lower dove counts the following spring. Summer rains in Iowa are characterized by high winds and hail which can readily destroy the loosely constructed dove nests. This mortality, however, does not affect dove populations in the long term.

Adult and Fledged Juvenile Mortality

Mortality for adult and fledged juvenile mourning doves is caused by diseases and parasites, predation, weather, accidents, egg retention in females and hunting (Hanson and Kossack 1963). Diseases and parasites which kill doves include fowl pox virus, Arizona paracolon bacteria, trichomoniasis, leucocytozoan marchouxi, haemoproteus infections, cestodes, microfilaria, three species of biting lice, and three species of mites (Hanson and Kossack 1963).

One disease of agricultural concern is the Arizona paracolon bacteria, which is a type of paratyphoid (Salmonella) organism. This bacteria, which can be carried by mourning doves, is known to infect turkey poults and can sometimes cause considerable turkey losses (Hanson and Kossack 1963). The pathogenicity of this disease in doves has not been studied in Minnesota.

The Cooper's hawk and sharp-shinned hawk are among the primary avian predators of mourning doves (Hanson and Kossack 1963). Ice storms in the South and mid-South also frequently cause widespread losses of wintering mourning doves.

At least 5 million Minnesota mourning doves die each year. After reaching a population peak of from 8 to 12 million by approximately September 1, mourning doves experience high mortality rates. This death rate is about 4.6% per day during this peak period in north central states like Minnesota (U. S. Fish and Wildlife Service 1979). In other words, over 300,000 doves from Minnesota may die every day from all causes after the population peaks in late summer. The mortality rate then decreases as the population decreases.

Rice and Lovrien (1974) determined the annual mortality rate in South Dakota was 60.3% for juvenile doves and 51.6% for adult doves. Minnesota data suggests an annual mortality rate of about 62%. If 8 million doves are present at the end of summer, about 5 million can be expected to die by the following spring, leaving a spring breeding population of about 3 million doves in the state.

Minnesota doves are currently being taken by hunters in 16 states of the United States, Mexico, and Central America (Hayne and Geissler 1977). This hunting occurs mainly in the early fall when dove populations are experiencing their highest rate of daily mortality. Hunting mortality replaces other mortality which is occurring at that time. The percentage of doves lost in Minnesota generally remains about the same -- about 62%. This is called "compensatory mortality." Conversely, if Minnesota established a season on mourning doves and Minnesota's harvest was added to the current harvest, the total annual loss would still be about 62% (Winston 1954, Hanson and Kossack 1963, Rice and Lovrien 1974, and U. S. Fish and Wildlife Service 1979).

Compensatory mortality means that the same approximate number of doves can be expected to return to Minnesota every spring for the state's citizens to enjoy regardless of whether or not they have been hunted the previous fall.

DISTRIBUTION AND ABUNDANCE

General Distribution and Relative Abundance

Mourning doves nest in all of the contiguous 48 states (Gresham 1977). Doves are resident throughout Minnesota except in Lake and Cook Counties and in the heavily wooded parts of St. Louis, Koochiching, and Itasca Counties (Green and Janssen 1975).

The relative abundance of breeding doves in the United States is determined annually by call-counts conducted by the U.S. Fish and Wildlife Service. Central Management Unit states with the highest dove densities are North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and New Mexico (Dolton 1980) (Fig. 1).

Henderson (1980) presented the composite June distribution of mourning doves in Minnesota from 1975 to 1979 as a function of doves counted per 100 miles of Breeding Bird Survey route for 14 regions in Minnesota (Fig. 2). The highest count, 337 doves per 100 miles, was in lower west central Minnesota,

including Big Stone, Swift, Lac qui Parle, Chippewa, Yellow Medicine, Redwood, Renville, Kandiyohi, and Meeker Counties.

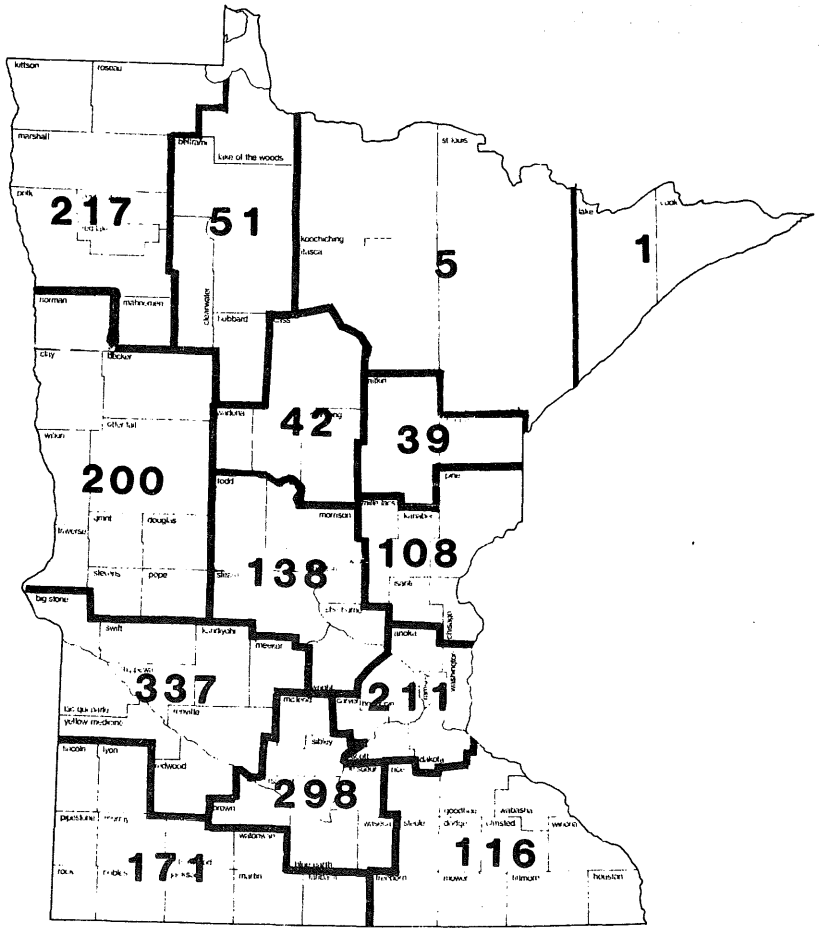

Figure 2. Average June count of mourning dove abundance, by region, from 1975-1979, expressed as doves per 100 miles of route.

The Department of Natural Resources has conducted August roadside wildlife counts in 64 counties in August from 1960 through 1980, which provided an index of abundance for mourning doves (Fig. 3). From 1960-1979, DNR personnel counted 213,032 mourning doves along 61,121 miles of survey routes. During that period doves were most abundant in the western 1/3 of the state with the highest concentrations occurring in Clay, Douglas, Grant, Pope, Stevens, Traverse, Ottertail, Norman and Wilkin Counties. The five-year average count for those

counties was 665 doves per 100 miles of survey route. This is 37% higher than the dove count for the lower west central part of Minnesota where doves were most abundant during the June breeding bird counts. This suggests that the large number of doves present in the more northern counties in the first half of August may represent local birds plus concentrations of doves already in migration and "summer flocking" birds in small grain and sunflower fields (Berner, pers. comm.).

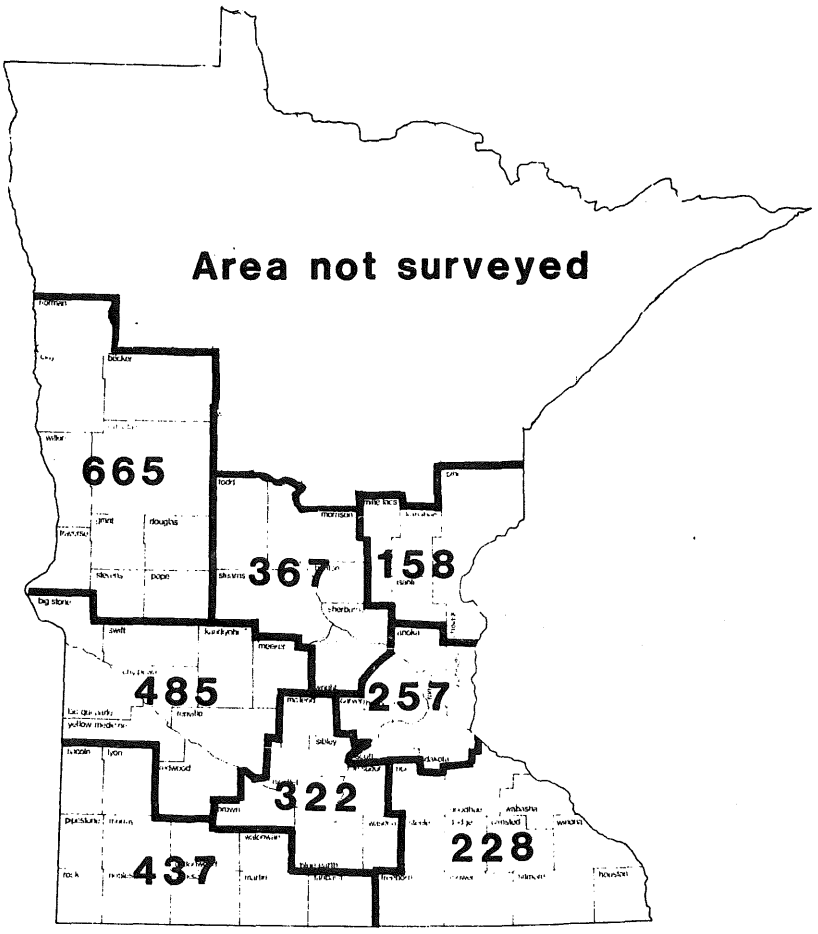

Figure 3. Average August count of mourning dove abundance, by region, from 1975-1979, expressed as doves counted per 100 miles of route.

Total Abundance

The mourning dove is the sixth most abundant bird in the nation and the most abundant game bird in the United States (Smith 1978). The fall population, which peaks about September 1, annually reaches approximately 500 million birds in the United States.

Dunks (1977) estimated that the 1974 fall population of doves in Minnesota was 7.9 million. However, Hayne and Geissler (1977) wrote that the average estimated fall dove population in Minnesota was about 12,800,000 from 1966 through 1971.

Population Trends

Dolton (1979) stated that the nationwide trend in mourning dove breeding populations is up 2.2% over the past 10 years. However, the May Federal Dove Call-Count census, the June Federal Breeding Bird Survey, and the August Minnesota roadside wildlife counts indicate that the breeding population of mourning doves has increased significantly in Minnesota since 1969. (An explanation of these surveys is given in Appendix A). According to the Federal surveys in Minnesota, dove breeding populations have increased between 6 and 8.5% annually since 1969 (Fig. 4). The total breeding population increase from 1969 to 1979 is between 85 and 125%. Since the Federal Breeding Bird Survey is based on more miles driven per year, it is probably a better indicator of the increase -- about 85%.

A large increase in mourning doves during the past decade also has occurred in other Central Management Unit states, including North Dakota, South Dakota, Nebraska, Colorado, and New Mexico (Dolton 1980).

The August roadside wildlife counts in Minnesota substantiate this long-term increase. From 1960-1979, August dove counts have increased 21.7% in the 64 surveyed counties (Fig. 5) (Berner, pers. comm.). Significant

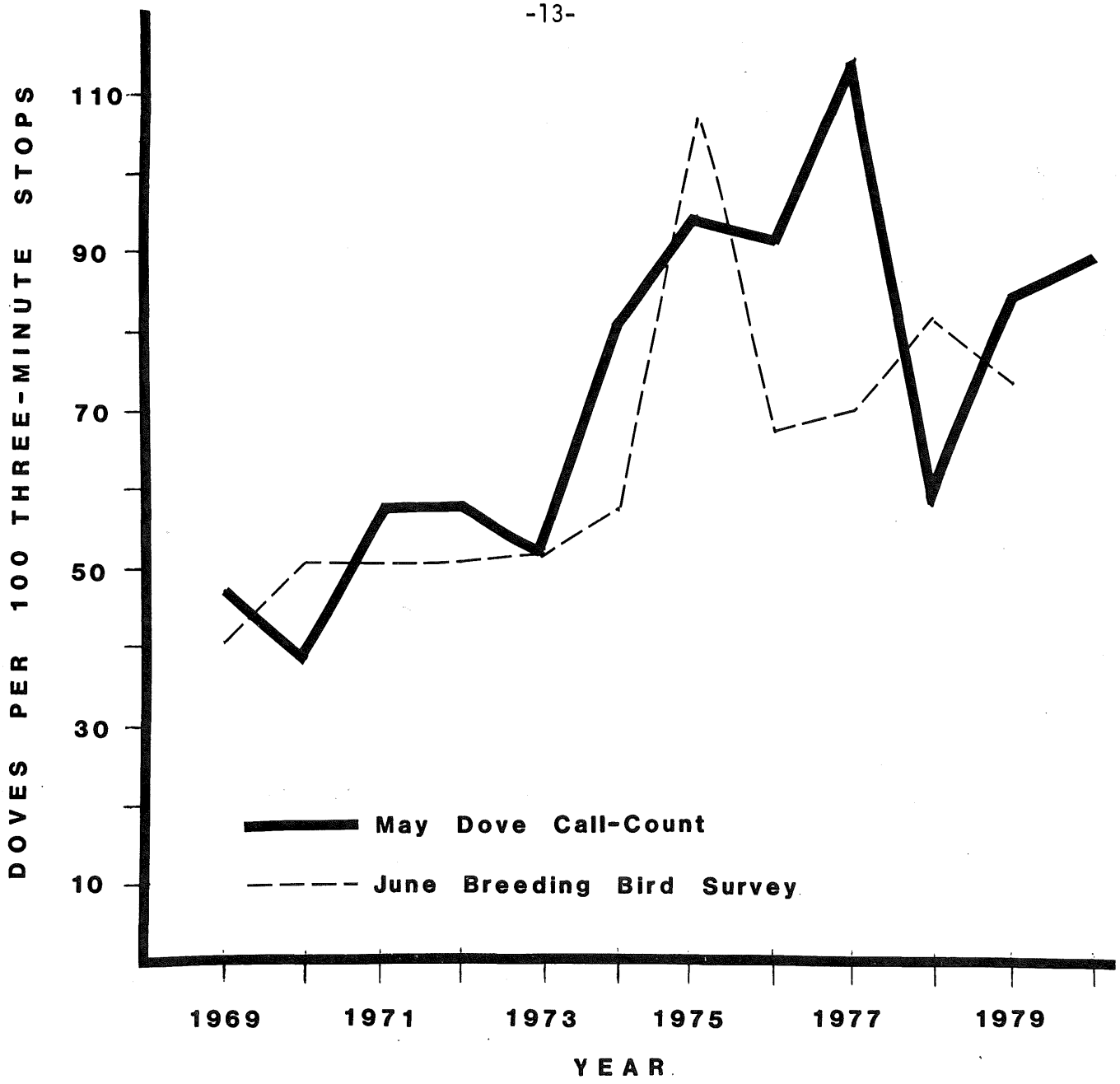

Figure 4. May and June counts of mourning doves in Minnesota from 1969-1980, expressed as doves per 100 three-minute stops.

increases in doves in northwest Minnesota have not been included in these counts, however. Dove populations continue to increase in the presence of modern agriculture and changing land use patterns except in south central Minnesota. Other game species like the ring-necked pheasant (Phasianus colchicus) have declined since 1960 (Fig. 5).

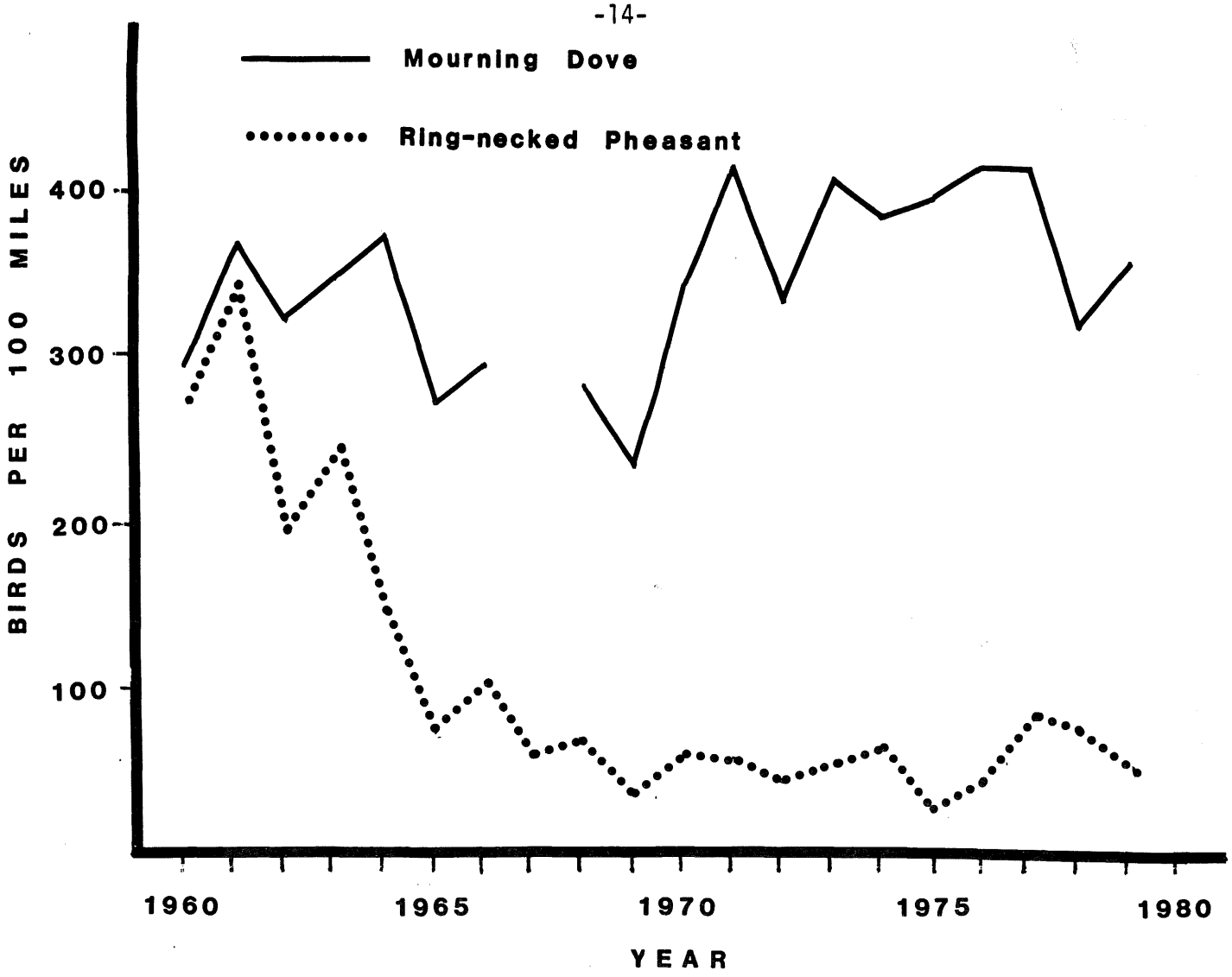

Figure 5. August road counts of mourning doves and ring-necked pheasants in Minnesota, 1960-1979, expressed as birds per 100 miles of route.

The statewide increase in mourning dove numbers since 1960 was not uniform (Fig. 6). The greatest regional increase, 96%, occurred in the western counties which include Becker, Clay, Douglas, Grant, Norman, Ottertail, Pope, Stevens, Traverse, and Wilkin. Moderate increases of 38-41% occurred through central and east central Minnesota. A 16-17% increase was detected generally from the metropolitan region westward to the South Dakota border. Dove numbers in southeastern Minnesota increased 6%. Declines of from 6-20% occurred in south central and southwest Minnesota. The decline in that area probably reflects a loss of farm shelterbelts and/or a decrease in small grain production.

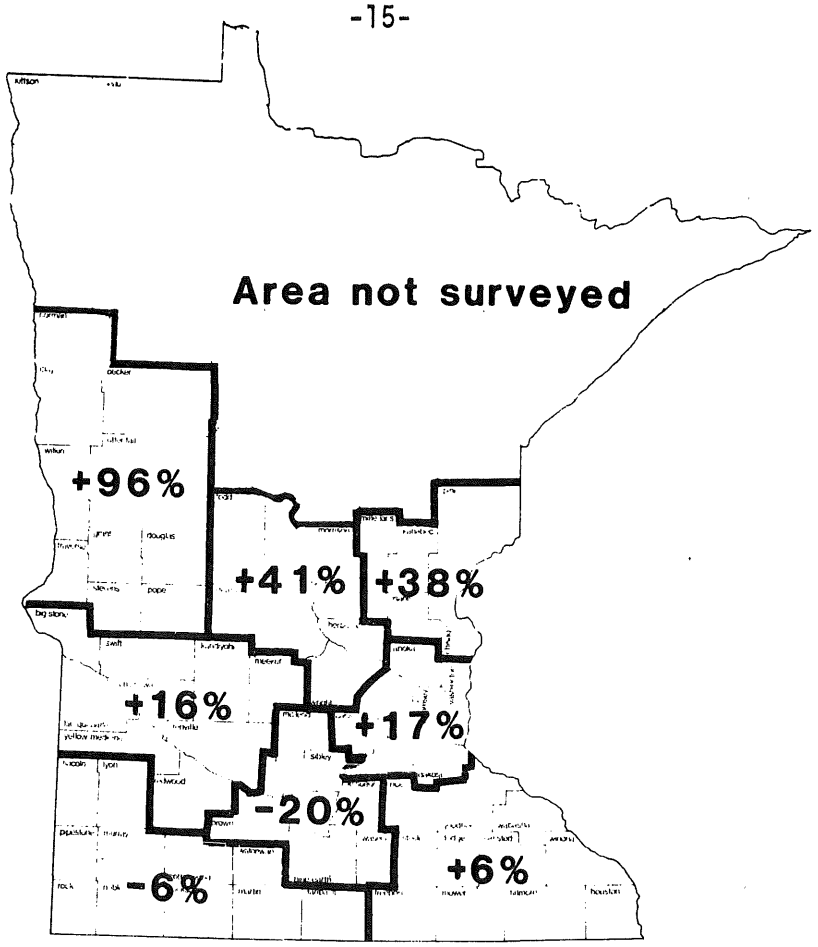

Figure 6. Percent increase in August road counts of mourning doves in Minnesota from the ten-year period 1960-1969 to the period 1970-1979.

STATUS AS A GAME BIRD

Federal and State Management

The mourning dove has been designated as a migratory game bird by the federal government for more than 60 years. It was designated as a game bird under the Convention for the Protection of Migratory Birds proclaimed by the United States and Canada in 1916 and in an agreement between the United States and Mexico in 1937 (The Wildlife Legislative Fund 1980).

The Fish and Wildlife Service in the U. S. Department of the Interior has the management responsibility for migratory game birds. Each year the Secretary of the Interior establishes the time and length of the seasons, daily bag limits, permissible methods of hunting, and other hunting restrictions. For management purposes the United States is divided into three "Management

Units" -- the Eastern, Central, and Western (Fig. 1). Minnesota is in the Central Management Unit. Each management unit has its own federal framework for state regulations.

The final regulations framework for the 1980-81 hunting season on mourning doves in the Central Management Unit allowed for shooting hours starting one-half hour before sunrise and ending at sunset daily. Daily bag and possession limits cannot exceed 10 and 20, respectively, in all states. Hunting seasons in all states cannot be more than 60 full days which can run consecutively or be split into not more than three periods. The framework for the season is from September 1, 1980 to January 15, 1981 (Federal Register 1980).

Individual states can approve or prohibit dove hunting or impose more limiting hunting restrictions, but the states cannot liberalize the federal regulations. Minnesota, Montana, and Iowa are the only states in the Central Management Unit which do not allow dove hunting. North Dakota prohibits hunting doves resting on utility lines and South Dakota prohibits hunting doves from roads.

Current Harvest of Doves from Minnesota

The current annual harvest of mourning doves from Minnesota is estimated to be over 600,000 (Table 1) (Hayne and Geissler 1977). Minnesota doves are currently harvested in at least 15 states, Mexico, Guatemala, El Salvador, Nicaragua, and Costa Rica. Hunters in Mexico and Central America harvested an average of 114,000 Minnesota doves annually from 1966 through 1971 (Hayne and Geissler 1977). Nearly half a million Minnesota doves, 488,300, were harvested by hunters in the United States each year from 1966 through 1971. About a quarter of a million of these doves, 227,000, were taken annually by Texas hunters. Other states in which 10,000 or more Minnesota-raised doves were harvested annually were Alabama, Florida, Georgia, Louisiana, Mississippi,

and Oklahoma (Hayne and Geissler 1977). Minnesota hunters are the only hunters in North America, other than those from Iowa, who are denied the opportunity to hunt mourning doves produced in Minnesota.

Table 1. Average annual harvest of mourning doves from Minnesota, 1966-1971. Source - Hayne and Geissler 1977.

State or Country	Number of Doves Taken
Texas	227,000
Mexico	109,500
Florida	83,300
Louisiana	66,000
Georgia	33,400
Alabama	30,400
Mississippi	18,200
Oklahoma	13,900
North Carolina	6,200
California	4,800
Central America	4,600
Arkansas	2,000
Kansas	1,300
Arizona	900
South Dakota	900
	602,400

Current National Status and Popularity as a Game Species

It is perhaps difficult for many Minnesotans to perceive the mourning dove as a game bird but there is a considerable amount of information which helps explain its current national status and popularity as a game species.

Mourning doves are the most abundant migratory game bird in North America. More mourning doves are harvested every year in North America than all other migratory game birds combined. More people hunt mourning doves than any other game bird. For these reasons the mourning dove is considered the number one game bird in the United States (Gresham 1977).

Each year approximately 3 million hunters in 33 states harvest about 50 million mourning doves. The dove hunting provides about 11.4 million recreational trips per year in the United States (Keeler 1977).

Dove hunting is a form of outdoor recreation which grows in popularity with the establishment of dove hunting traditions. In Illinois, for example, about 10% of all hunters hunted doves in the late 1940's. In the late 1950's this percentage had increased to 18. In the 1960's about 23% of all Illinois hunters pursued mourning doves (Preno and Labisky 1971). A Florida study revealed that 35% of all Florida hunters hunted doves (Winston 1954).

An indication of how popular dove hunting can become is seen in the comment by Jessee (1958) from Oklahoma:

> "For more than twenty years doves have provided Sooner nimrods with some of the trickiest bird shooting on the North American Continent. If game technicians of Oklahoma should ever dedicate a monument to the state's most outstanding game bird, it is an even bet that the mourning dove would be among the top contenders for the honor. The dove has proven itself to be a first class game bird."

One reason for the popularity of dove hunting is the widespread abundance of the species. Hunters do not need to travel very far to participate. For example, in Illinois, 82% of all dove hunting from 1956 through 1969 was done in the hunters' own counties of residence (Preno and Labisky 1971). In Florida

about two-thirds of the hunters hunted in their own county of residence while most of the remaining hunters hunted in adjacent counties (Winston 1954). This is in contrast to the travel pattern that has become common for pursuit of many other game species which requires considerable expenses for fuel. Anderson et al. (1976) wrote that the average round trip distance traveled by goose hunters who hunted at the Lac qui Parle Wildlife Refuge in western Minnesota was 178 miles in 1976. Another apparent benefit of this tendency of dove hunters to hunt in their own county of residence is that there is less potential for trespassing to be a problem since many hunters would be acquainted with local landowners.

Another reason which adds to the popularity of dove hunting is the quality of the meat. Brister (1975) wrote that the dove is the "best-eating game bird of them all." Johnson (1968) stated that the meat of doves is tender, dark, and has an excellent flavor. Because two dove breasts can serve one person and the daily limit on mourning doves is ten, the results of a successful day's hunt can be enough to serve as many as five or more people.

The trend in recent years has been for more northern states to adopt dove seasons. Wyoming established a season in 1973, Nebraska in 1975, and North Dakota in 1979 (Dolton 1978, Dolton 1979, The Wildlife Legislative Fund 1980). The South Dakota legislature passed a bill to allow a dove season in 1979. The opening of the season was blocked by an initiative referendum petition and the question of whether or not to allow a mourning dove season was voted on by the people of South Dakota in the 1980 general election. The citizens of South Dakota endorsed the dove season by a margin of 58% to 42%, so they will open a season in 1981. The White Earth Indian Reservation in Minnesota declared a season on mourning doves on reservation lands for tribal members for the first time in 1980. The season was from September 13 through October 31.

The dove seasons in northern states have been working out well. When North Dakota had its first dove season in recent years in 1979, it was considered very successful in all respects by Game and Fish Department Commissioner Larry L. Kruckenburg.

History as a Game Species in Minnesota

Mourning doves were unprotected in Minnesota until 1891. Then the season was closed by the legislature until 1899. From 1899 until 1946, the mourning dove was hunted for 42 of the 48 years. From 1939 until 1946, the average annual harvest was about 21,000 (Johnson et al. 1967). The dove season was closed by the legislature in 1947 and has remained closed to the present time.

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Appendix A. Population Surveys of Mourning Doves in Minnesota

Three surveys are made annually in Minnesota which determine population trends in mourning doves. The first of these surveys is the call-count survey which has been conducted by the U.S. Fish and Wildlife Service nationwide since 1953. Call-count routes are each 20 miles long and consist of 20 stops. The number of doves seen and heard during a three minute period is recorded at each stop. These routes are run from May 20 through May 31. There are about 1000 routes in the United States. Twelve routes exist in Minnesota. This is one of the most extensive wildlife surveys for a single species in North America.

The second survey is the federal breeding bird survey which is also conducted by volunteers for the U.S. Fish and Wildlife Service. There are 52 breeding bird survey routes in Minnesota. Each route is 25 miles long. Observers stop every half mile and record the number of doves as well as all other bird species which are seen or heard during a three minute period. This survey has been run every year since 1967. A total of 11,327 doves have been counted along 9725 miles of survey routes from 1967 through 1979.

The third survey, run by the Minnesota Department of Natural Resources, is an August small game road count which is conducted in 64 counties in the agricultural region of the state.

About 150 routes are run in Minnesota each year. These standardized routes have existed since 1956. They are completed from August 1 through August 15. The August roadside counts include a tally of all doves seen while driving a 25 mile route at 15 to 20 miles per hour.