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THE STATUS OF MIGRATORY GAME BIRDS: 1939-40

Prepared in the Section of Distribution and Migration of Birds
Division of Wildlife Research

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INTRODUCTION

The experience of the past few years conclusively demonstrates that under a program of sound management, the United States, Canada, and Mexico can continue to enjoy reasonable sport with migratory game birds and at the same time perpetuate them. The rehabilitation of the ducks and geese, while by no means complete, has progressed so far that the success already attained should stand for all time as a monument to practical conservation. Some of the highly artificial methods of shooting, which formerly resulted in large kills by a limited few, probably must continue to be prohibited, but this action will have the desirable result of spreading shooting privileges more equitably among the whole hunting fraternity.

The Biological Survey has continued its investigations of the migratory waterfowl on the breeding and wintering grounds and elsewhere during migration, and in consequence believes that it possesses more adequate and complete information on the subject than is available to any other agency.

Former reports on the status of these game birds have dealt chiefly with ducks and geese. In this report these groups continue to form the major subject of discussion, but data are included on the status of other migratory species on which open seasons are provided.

PART 1: MIGRATORY WATERFOWL

Spring Migration

The preceding report issued by the Biological Survey on this subject (Wildlife Research and Management Leaflet BS-136) concluded the account of investigations with the inventory of January 1939. The gross figures obtained from this operation indicated that the continental population of waterfowl had increased about 14 percent over that of January 1938. While the rate of increase showed a tendency to decline the situation was considered satisfactory.

The general accuracy of the inventory figures was substantiated by reports covering the spring migration from the corps of volunteer observers. The number of these reports received was 298, and for "waterfowl in general" 57 reported no change, 31 noted a further decrease, while 210 showed an increase. In other words, 71 percent of the observers noted increased numbers in the spring flight of 1939.

Analyzed by species, the result was equally encouraging, for while the rate of increase varied widely with the different species, in no case did the reports of decrease exceed those of increase. As has been the case during the past 5 or 6 years, the species with the most unsatisfactory status was the redhead, for which the rate of decrease actually rose 1 percent. For the season under consideration, however, the number of reports of decrease was only 25 as against 79 of increase, and 89 of no change. As was to be expected, the species with the most extensive ranges, as the mallard, pintail, green- and blue-winged teals, and Canada Goose, made the most impressive gains.

Breeding-Ground Surveys

Pacific Flyway

Luther J. Goldman, the biologist of the Pacific Flyway, left his headquarters early in April and proceeded to Alaska. This territorial possession of the United States has never been accorded its rightful importance

among the waterfowl breeding grounds of the continent. Nevertheless, it appears that were it not for Alaska there would be little shooting of ducks and geese for sport anywhere in the Pacific Flyway. This is definitely indicated by the recovery records of pintails and wigeons (the chief species of game ducks on the Pacific coast) that have been banded at stations in California. It is true that some ducks from the central and northern nesting grounds of Canada cross the mountains and fly southward along the coast, but the number of these is but a fraction of the Pacific coast birds that summer in Alaska.

Following some preliminary investigations of the northward migration, which were made in the deltas of the Copper and Behring Rivers, as well as on the Susitna Flats near Anchorage, the Survey biologist went by airplane to Fairbanks, the starting point for the long trip down the Yukon River. Summer studies of waterfowl populations and habitats were made in the valleys of the Yukon, Kuskokwim, Tanana, Innoko, and Iditarod, as well as in other rivers of lesser importance. When the work was concluded in the twin deltas of the Yukon and Kuskokwim, a reconnaissance was made north to the delta of the Noatak River, tributary to Kotzebue Sound.

The investigations in Alaska were carried out in the closest cooperation with, and by the constant aid of, the Alaska Game Commission. Agents, boats, and planes, some of the last named privately owned by the wildlife agents, were always made available, thus enabling Goldman to reach areas the inspection of which he could not otherwise have attempted.

In trying to visualize the extent of these far northern breeding grounds, "vast" is the only term that seems adequate. A waterfowl habitat, literally hundreds, if not thousands, of square miles in extent and as good today as it was a hundred years ago, calls for a stock of birds to use it. Not only are the cover conditions ideal but also some of the choicest food plants such as sago and other pondweeds occur there in abundance. On this subject Goldman says: "Vegetation grows in profusion at low elevations in Alaska, even on the Arctic tundras. Many sloughs. . . abound in pondweeds of which it is said there are 12 species in the Territory. Sago pondweed and a clasping-leaved species are common representatives. Milfoil, white water buttercup, and goosegrass (Equisetum), grow in abundance."

In commenting on the status of the birds during the summer of 1939, Goldman summarizes his own experiences and the reports made to him by the wildlife agents of the Alaska Game Commission and others. The consensus was that there was a distinct improvement in the numerical status of the geese, swans, and cranes. The duck population was considered satisfactory, but no conspicuous gains over the 1938 figures were noted. He cautions against overrating the signs of improvement for the reason that the Alaskan nesting grounds are still greatly underpopulated.

Central and Mississippi Flyways

George B. Saunders, the biologist of the Central Flyway, spent the summer months in a study of waterfowl conditions in Saskatchewan and Alberta. Operations were carried on by the use of an automobile as far north as the central part of these Provinces and were then extended by the use of an airplane northward from there to Frobisher Lake in Saskatchewan and to Lake Athabaska in Alberta.

Charles E. Gillham, the biologist of the Mississippi Flyway, again devoted the season to a study of nesting on the breeding grounds of the far North. In order to be there as soon as possible after the ice went out, he traveled by airplane from Edmonton, Alberta, to the Eskimo village of Aklavik in the delta of the Mackenzie River, which he reached on June 8. With outboard motor and canoe, he worked northward to the coast, traversing with this small outfit more than 1,200 miles of winding streams where the great Mackenzie fans out into the Arctic Ocean. On this trip he inspected a countless number of flats and islands, mostly without names, and again made an attempt to reach the Perry River region on the south shore of the Queen Maud Sea. Because of adverse weather conditions and the death of the pilot engaged to make the flight, Gillham finally had to abandon the plan after he had worked eastward as far as Coppermine on Coronation Gulf. A great unknown waterfowl-breeding ground probably exists in the vicinity of the Perry River, but the difficulties of adequate investigation of this area are almost insurmountable. Transportation by air there is essential but, because of the severity of Arctic storms, flights are frequently impossible.

After his attempt to reach Perry River, Gillham returned to Fort Chipewyan on Lake Athabaska where he spent a month investigating the status of the ducks and geese of this well-known breeding area. His work here was connected with studies made by Saunders. Thus, the great interior breeding grounds in Canada were covered from the border of the United States to the Arctic coast.

In the agricultural sections of Alberta and Saskatchewan a distinct improvement was found in the water supply, with consequent increase in production of ducks. Of 17 districts surveyed in Alberta, 13 showed an increase and 4 a decrease in the number of birds; while of 9 districts studied in Saskatchewan, 6 carried more ducks, 2 had less, and 1 showed no change in status. In some instances the percentage of increase was very low and some of the decreases were conspicuous, but in summarizing results for the entire region covered, Saunders concluded that an increase in the fall flight was a justifiable expectation.

The development of 8,494 small water areas in the Provinces of Manitoba, Saskatchewan, and Alberta, under a program sponsored by the Dominion Government with the passage in 1935 of the Prairie Farms Rehabilitation Act, must be accorded its proper place as an important supplement

to the Biological Survey's waterfowl-refuge program in the North Central States and to water impoundments and similar developments by other agencies in both countries. Since April 1935, when the Canadian Parliament passed the act, the following appropriations are known to have been made: \$1,250,000 in the fiscal year 1935; \$1,184,420 in 1936; and \$2,000,000 in 1937. By July 1939, the Dominion had completed a total of 5,538 "dugouts," 2,388 stock-watering dams, and 568 irrigation projects. More than 200 larger, municipal-community, projects had been completed, 148 in Saskatchewan, 50 in Alberta, and 6 in Manitoba. In some instances at least, these restored water areas were immediately adopted for use by waterfowl and their value will increase as time goes on and as food and cover plants become better established.

As has been stated before, the vast breeding grounds "north of the bush" have not been altered by human activity and are today as satisfactory for nesting waterfowl as they were when the white man first found them. The problem is to send back a sufficient number of birds to stock them. Reporting upon his work in that region in 1939, Gillham wrote: "In 1935 the writer felt that many species of ducks could not be brought back, that many varieties were doomed to pass on into oblivion. The great change manifest in the abundance of practically all species here this year does not bear this out. . . . There seems little doubt but that the drastic regulations, including curtailing baiting and using live decoys, have borne fruit and that the waterfowl population is on an upward swing in its abundance." In some districts, notably in the vicinity of Lake Athabaska, water levels were unusually low, but this condition had relatively little significance in a country where the normal area of water is almost the same as that of the land. Gillham's observations were supported by those of Indians and others who claimed that the number of birds was greater than at any time in the past 15 years.

This was Gillham's fifth consecutive trip to northern Canada and the following quotation from his report will be of interest as illustrative of the conditions under which these investigators work:

"With a fish net and a seal harpoon it is possible to visit the great nesting grounds of the North and learn much of them. The comforts are few and far between, clouds of mosquitoes are first encountered, to be later supplanted by the even more poisonous black flies. Twenty hours daily of sunshine overshadowed by severe coastal rainstorms and wind of almost gale proportions does not add to the comfort of field work. The constant daylight discourages restful sleep after severe daily activities, and poor native food often leaves one in a funk, especially when he has acted as host to several thousand insects daily.

"Large lakes, frozen solid, surround the mud flats where waterfowl are nesting. Heavy fogs rise from the icepack only 2 miles offshore on the Arctic Ocean. The chilled and saturated air makes the wearing of native caribou parkas and skin pants a necessity.

"Yet the main river channels are open, and shallow lakes on the mud banks are thawed out. Here in almost freezing temperatures, while hardy plants flower and mosquitoes buzz, one may see the geese, swans, and black brants. Inland a few miles, Canada geese, sandhill cranes, white-fronted geese, pintails, and scaups are to be observed. Still farther up river one may note the green-winged teals, wigeons and mallards, and even a fair number of shovelers.

"A small canoe is towed behind the big one. It can be transported upon a man's back to inland lakes. When packing is to be done back away from the water for any distance, dogs are often employed. These creatures carry as much as 35 pounds each, after the manner of pack burros in the Southwestern States.

"There is probably no field work anywhere in the world that is much slower or more tedious or filled with greater hardship, once the airplane is abandoned. The tundra is soggy underfoot, large lakes halt one's progress, and small streams and pockets of water need be crossed and recrossed often hundreds of times daily. One is sopping wet most of the time. This, coupled with mosquitoes, poor fare, and often little or no wood to cook with or dry out by, adds to the misery of travel.

"In the summer months the Eskimos do not traverse this country. They meet at camping places on the open coasts where cold winds discourage the insects. Here the whaling and fishing for the next winter's food supply is carried on. As no one relishes this country by summer it is difficult to obtain a native with canoes for a trip. Usually, some chap who has had a poor trapping season by virtue of his own poor equipment and lack of initiative is all there is to be had. The resultant help and boats leave much to be desired and do not add to one's efficiency of comfort. In many places money is little used and it is difficult to hire a man for such worthless paper. He cannot eat it and is usually more interested in working for himself, putting up whale and fish."

Atlantic Flyway

Harold S. Peters, the biologist of the Atlantic Flyway, operated in the Maritime Provinces of Nova Scotia, New Brunswick, and Prince Edward Island during May 1939. Upon invitation by the Canadian Government he joined the personnel of the Eastern Arctic Patrol. Leaving Montreal on July 8, on the R.M.S. Nascopie, the expedition sailed northward along the coast of Labrador, crossed Hudson Bay to Fort Churchill, Manitoba, again crossed the Bay and proceeded northward, touching at points on Baffin Island and other islands in the Arctic Archipelago, finally reaching the most northerly point of call at Craig Harbour, Ellesmereland. This region is the summer home of the Atlantic brant, and of the blue and snow geese, as well as of several species of sea ducks. The party returned to Montreal on September 25, with much useful information concerning the bird life of the eastern Arctic. Before returning to his headquarters at Charleston, S. C., Peters devoted about two additional weeks to checking waterfowl conditions in the Maritime Provinces, during the early part of the hunting season.

At the conclusion of the work in June the indications pointed to a good hatch of ducklings in Nova Scotia and New Brunswick. Nevertheless, subsequent checking in September showed very little improvement over 1938, probably because of a late spring and high waters, which cut down the size of the broods. As is well known, the black duck is the principal nesting duck in that region, but it is gratifying to record a steady increase in the number of nesting pintails, blue-winged teals, and ringnecks. Little change was noted in the status of the Canada goose.

Nesting Conditions in the United States

Because of greater spring run-off the breeding season of 1939 showed improved nesting conditions on the Federal refuges of the Biological Survey, with a resultant increase in the production of waterfowl. On one refuge in the northern Great Plains, however, breeding areas were not so heavily utilized as in 1938, because improved water conditions in the surrounding territory resulted in a dispersal of the birds. In the sand-hill region of Nebraska also the production of waterfowl was limited to some extent by drought.

On the Lake Bowdoin Refuge, in eastern Montana, a substantial increase in nesting waterfowl was observed, especially of pintails, redheads, ruddy ducks, lesser scaups and cinnamon teals.

An outstanding increase in breeding ducks was reported on the Lower Souris Refuge, in North Dakota, where it was estimated that 250,000 young were raised during the 1939 season as compared with 40,000 during 1938.

The Waubay Refuge, in South Dakota, was favored with an increase in the number of breeding ruddy ducks, baldpates, and blue-winged teals.

The refuge manager at the Camas Refuge, in Idaho, reports increased nesting by baldpates, green-winged teals, blue-winged teals, and redheads. It was also observed that there were at least three times as many pintails on the area during the nesting season of 1939 as in 1938. Large numbers of these birds also apparently concentrated on the refuge to pass the molting season.

A considerable increase in the production of waterfowl was noted on the Des Lacs Refuge, in North Dakota, during the 1939 season.

The manager of the Red Rocks Lake Refuge, in Montana, reported more nesting Canada geese than at any time since its establishment. Substantial increases were noted also for other nesting waterfowl.

At the Sand Lake Refuge, in South Dakota, there were decided increases in nesting redheads, canvasbacks, and ruddy ducks.

Reports from the Snake River Refuge, in Idaho, indicated that 300 pairs of Canada geese nested on the island in 1939 as compared with 75 pairs in 1938.

The Bombay Hook Refuge, in Delaware, showed increased breeding by such species as the blue-winged teal, black duck, and shoveler. The shoveler was first found nesting there in 1938, when 18 pairs were counted. In 1939, 31 broods of shovelers were reared to maturity.

It was estimated that approximately 126,000 waterfowl were produced on the Mud Lake Refuge, in Minnesota. Of these, the blue-winged teals were most abundant, with American coots, mallards, shovelers, baldpates, gadwalls, and pintails following, in the order named.

The 1939 nesting season at the Malheur Refuge, in Oregon, was generally more favorable than in the last few years. Hatching success for both ducks and geese there was remarkably high. Increases were noted in the average number of eggs per nest, in the percentage of eggs hatching, and in the size of broods raised to maturity. The number of waterfowl using the refuge during migrations showed a marked increase.

Nesting studies on the Medicine Lake Refuge, in Montana, showed an increase of 100 percent in breeding waterfowl over the number for 1938. This was undoubtedly due to improved water conditions.

From the cooperative research station in Iowa, where the redhead was the subject of an intensive study, came the report that brood counts for the 1939 season showed that, on the average, approximately seven in each brood attained maturity. On the Ruthven area this number was exceeded only by the mallard and the blue-winged teal.

Throughout the United States as a whole, conditions for increased production of waterfowl were generally improved. Shortage of water in most of the Great Plains area had a limiting effect locally, but improved conditions elsewhere more than offset that drawback.

Fall Migration

The fall migration proved interesting because of a delayed movement of the birds, traceable directly to the exceptional climatic conditions then prevailing over most of the continent. The advent of storms and freezing temperatures was delayed until the season was well advanced, with the result that ducks and geese were able to linger farther north than usual. Finally, however, with a quick closing in of winter conditions, there was a rapid movement of the flocks to winter quarters. This fact must be kept in mind in evaluating reports of the migration. In some parts of the country the birds passed through so rapidly that they were all but unobserved, particularly in regions of water shortage. For example, in Missouri and Oklahoma sportsmen were almost unanimous in reporting a disappointing hunting season, some believing that the birds had gone south by other routes or had suffered a serious catastrophe.

The observers carefully selected by the Survey were on the alert, however, and they prepared and sent in to the Washington office more than 500 reports. Gross analysis of these statements for all waterfowl showed 232 reports of an increase, 61 of no change, and 133 of a decrease in numbers. There was considerable deviation in the percentages from those of 1938. Although the percentage of no change dropped from 19 to 14, and the percentage of increase fell from 75 to 55, that for decrease rose from 6 to 31. As stated above, these results are probably due at least in part to the abnormal weather conditions and the resulting rapidity of the migration.

On the basis of direct statement of "increase," "decrease," or "no change," and considering the country as a whole, it appeared that nearly all species had made satisfactory gains. For no species did the total reports of decrease exceed those of increase. The ruddy duck and the ring-necked duck made the poorest showing.

Analysis according to the respective flyways showed the most satisfactory conditions in the Atlantic and Mississippi regions, a very slight improvement in the Pacific, and a distinct loss in the Central. In the last named, the percentage of decrease rose from 10 percent in 1938 to 36 in 1939. Lack of adequate water areas over much of this flyway is the obvious reason for the poor showing.

Wintering-Ground Surveys

Studies in Mexico

As the ducks and geese moved southward to their winter quarters they were accompanied by the flyway biologists. Since previous investigations demonstrated that the most important wintering grounds of the Pacific and Central Flyways are now in Mexico, Saunders and Goldman resumed their studies in the eastern and western parts of that country, respectively.

On the east coast, Saunders repeated much of his investigation of 1938-39. Operating by automobile, boat, and airplane from temporary headquarters at Brownsville, Tex., he carried on the work southward on both the Gulf and mainland sides of the Laguna Madre to Tampico. West of that city he thoroughly covered extensive marshes, including those along the Rio Tamesi, and the Lagunas Chairel, Tortuga, and Pueblo Viejo. From Tampico he made studies southward to the head of the Laguna Tamiahua. Continuously unfavorable flying weather during January prevented his making the aerial survey on dates comparable with those of the preceding winter, although he devoted three days, February 20, 21 and 22, to this operation in the coastal region of Tamaulipas and northern Vera Cruz, surveying the area from the mouth of the Rio Grande to the southern end of the Laguna Tamiahua.

As indicated in the previous report, drought in the eastern parts of these two Mexican States, has greatly reduced the number of fresh-water lakes and ponds available for wintering waterfowl. The present investigation showed the situation to be much worse, more than 90 percent of the inland lakes and ponds being completely dry by midwinter, many of them in this condition early in the season. Because of the low stage of the Rio Grande, many adjacent oxbow lakes, or "bancos," were dry or nearly so. These were not replenished until March 27, when an early rise of the river level sent water into old channels and other undiked lowlands. The salt-water lagoons west of the barrier ridge contained seepage water from the Gulf of Mexico but were much reduced in area as compared with 1938-39.

The Laguna Madre itself had a level below that of the previous year because of a series of northers, which blew much water out through the four passes into the Gulf. All but one of these passes are narrow and shallow, so that the volume of water entering the lagoon, even at high tide, was not sufficient to maintain a satisfactory level. As a result, broad bays and other shallow areas near the north and south ends were entirely dry. This condition, however, did not affect the ducks as much as did the lack of fresh-water ponds and lakes on the mainland to the west and on the peninsula and islands to the east. Nevertheless, even in this the worst drought in a score of years, there were some ponds on the mainland near La Carbonera, on the Barrera ranch farther south, and also near Loreto and San Jose. On the peninsula a few ponds and a small marshy area of a few acres remained, but fresh water on the barrier islands was apparently limited to a few wells dug for cattle.

Serious drought extended south at least to northern Vera Cruz. The most recent floods causing water to spill over into the adjacent lagoons and marshes from the Tamesi and Pamuco Rivers had been in the fall of 1936. Thus, the Tumpico lagunas were about as low as at any period old-timers could recall, and large lagunas, as the Champayan, had receded so much that scores of square miles of mud flats, covered with dry aquatic vegetation, surrounded the shrunken water area.

Despite all these obviously unsatisfactory conditions, the waterfowl that wintered in the region apparently had no difficulty in finding suitable habitats. So far as could be determined, there was no limiting factor present that reduced the carrying capacity below the number of ducks that desired to winter in or temporarily occupy the areas. The potential carrying capacity for both diving and shoal-water species, was far in excess of the number that actually used it. There was an abundance of choice food plants, including wigeongrass, wildcelery, and pondweeds.

From a consideration of all the studies made, it was concluded that the total number of ducks wintering in eastern Mexico showed a slight increase over that of 1938-39, despite the fact that certain species, as the gadwall and baldpate, showed from a little to a pronounced decrease.

The pintail, green-winged teal, and shoveler accounted for most of the gains. Geese in general showed a marked decrease, the lesser Canada goose, which is the most common species on the northeastern coast of Mexico, falling off at least 30 percent. Saunders concluded that "the duck population of eastern Mexico this winter was 5,000,000 and probably even more."

To work in western Mexico, Goldman crossed the line at El Paso, Tex., early in November and spent most of the month investigating waterfowl in Chihuahua and Coahuila, where there are several important lakes, as the Laguna Encinillas or Ojo de Agua, the Laguna de Bustillos, the ponds and arroyos that make up the headwaters of the Rio Sacramento, and the two Boquilla reservoirs that are formed by dams across the Rio Concho.

While fair numbers of ducks, geese, and cranes were found, it appeared that the waterfowl population was somewhat smaller than in 1938-39. As a result of the use of river waters for irrigation the large, shallow lakes known as the Laguna de Mayran and the Laguna de Viesca have become practically dry. Periodically, however, some water overflows into the lowest parts of the lake beds. During the season of 1938, precipitation was heavy on the river headwaters in the Sierra Madre, much water reaching the Mayran "sump" and affording a fine winter feeding and resting area for waterfowl. During the winter of 1939-40, however, the sump was a wide mesquite-grown flat, supporting a fine growth of grass and weeds--an excellent stock range, but of little value to ducks. In this connection it should be pointed out that these areas in Chihuahua and Coahuila are probably parts of the Central rather than of the Pacific Flyway.

After making these studies, Goldman proceeded south to Mexico City, and thence westward to the States of Colima, Jalisco, Michoacan, Morelos, and Guerrero. He checked such important sections as the Lagunas Chapala, Zapotlan, Buyutlan, Magdalena, Atoyac, and Patzcuaro, the twin deltas of the Duero and Lerma Rivers, as well as many areas of lesser significance, as the Lagunas Tilapan, Zacoalco, Dayula, and others, and made a trip eastward to the Laguna de Carmen in Puebla.

Field work was continuous over a period of nearly 5 months, during which Goldman traveled 10,600 miles by automobile, train, boat, and dug-out canoe. He made investigations in 17 Mexican States and also while en route there, in California, Arizona, New Mexico, and Texas. Interesting quotations from his voluminous report might be used in summation, but it must suffice to record that as a result of his studies he concluded that "the duck population of the Mexican tableland and west coast materially decreased during the winter of 1939-40 from that of 1938-39." Geese and cranes maintained and possibly even improved their status. The season was abnormal, warm weather in California resulting in delayed flights southward; it is known that ducks were exceptionally abundant in southern California during December.

There were, however, exceptional cases in Mexico. For example, a large concentration of waterfowl was recorded from San Jose de Babilcora in Chihuahua, and there was a good wintering population of lesser scaups on the Laguna de Papagallo, at Acapulco in Guerrero. Similarly, on the Laguna de Carmen, in Puebla, Goldman recorded "one of the finest gatherings of waterfowl I have seen in south-central Mexico." In this concentration pintails were well represented, and there were many canvasbacks, but the most remarkable occurrence was that of fully a thousand each of white-fronted geese and little brown cranes, at a point well south of their normal winter range.

Studies in the United States

In the Mississippi and Atlantic Flyways, biologists Gillham and Peters devoted the winter to studying the concentrations of ducks and geese in the lower Mississippi Valley and on the south Atlantic coast. It is important to remember that the waterfowl wintering grounds of these two flyways are chiefly within the United States, presenting a responsibility for the birds at this season that for the other two flyways is shared with Mexico. There is reason to believe that large flocks of ducks from the Atlantic Flyway cross the Straits of Florida to winter in extensive swamps and at the head of bays in Cuba, and that some continue eastward across the Windward Passage to wintering grounds in Haiti and the Dominican Republic. The number of birds that make these trips is not now known, but it may be large. In the light of present knowledge, however, there is no important wintering ground for the ducks and geese of the Mississippi Flyway that is outside the United States.

Gillham concentrated on Louisiana, covering not only the vast coastal marshes from the Mississippi Delta west to the mouth of the Sabine River, but also the important rice-growing belt north of this district. He repeatedly visited the large Federal refuges and made a special trip to the northwestern part of the State to study unusual conditions resulting from the overlapping in that area of the Mississippi and Central Flyways.

Peters' work in the field was from Chesapeake Bay south to Cape Sable, Fla. In this region there also is a series of waterfowl refuges, which were kept under close observation. As a licensed airplane pilot, Peters frequently took advantage of his training to employ small planes for making surveys of important feeding and resting grounds.

Both these biologists were available for the January inventory in two of the most important and difficult regions. They reached the conclusion that there had been a gratifying increase in the numbers of waterfowl of the two flyways. In the Atlantic Flyway, Peters noted a distinct improvement for the canvasback, but little change for the redhead. An unusually heavy kill of Canada geese in the Mississippi Flyway cut down what otherwise would have been a satisfactory increase.

Supplementing the work of all the flyway biologists were weekly or monthly reports from dozens of refuge managers, regional biologists, game-management agents, and other Bureau personnel. Information from these sources flowed in so steadily that the story of the movements of the birds and of the conditions affecting them was virtually complete.

January Inventory

The sixth consecutive January inventory of migratory waterfowl was conducted under exceptionally trying conditions but with results that completely justified the methods employed. Under the leadership of the 10 regional directors practically the entire field force of the Bureau was thrown into this operation, aided by the Army Air Corps, the Naval Air Service, the Coast Guard, a commercial tire and rubber company, the Forest Service, Soil Conservation Service, National Park Service, State forestry, police, and game and fish departments, and others. No attempt has been made to compile a complete list of participating personnel but the estimate is between 2,000 and 3,000--a fine corps of trained observers.

While the advent of winter over much of the country was delayed nearly to the holiday season, it closed in about at inventory time with an intensity that has not been equaled in many years. Freezing weather extended to the Gulf coast and deep snows were prevalent. Despite these unusual and frequently hazardous conditions, the inventory was carried out on schedule.

The 1940 estimates indicated that there were somewhere in the neighborhood of 65,000,000 ducks and geese on the continent. These figures represent an increase of about 15 percent in the waterfowl population since January 1939, and nearly two and one-half times the count of 1935. The 1940 population is probably very close to half that of 1900.

When arranged by flyways, the results of the inventory showed a decided lack of uniformity as had been indicated by study of the fall migration. As in the past few years, the Atlantic and Mississippi Flyways this year harbored most of the ducks and geese. The Central Flyway showed a large decrease in all species, while in the Pacific Flyway the status of the birds remained almost at the 1939 level.

According to species, the mallard and the pintail are making the best recovery, due of course to their extensive ranges. Black ducks show a slight decrease, which may be more apparent than real. Although but little improvement can be detected in the status of the redhead, the canvasback shows a satisfactory increase. The population of Canada geese is somewhat greater than last year, but the increase does not come up to expectations, probably because of the excessive slaughter of these birds in one or two areas during the past hunting season. Both blue and snow geese show a satisfactory increase.

Starvation of Ducks

Shortly after the inventory and while the country still remained in the grip of severe winter, widespread reports of alleged wholesale starvation

of waterfowl began to appear in the press. As a rule, the facts were greatly exaggerated, but some losses did occur. Local reports were over-publicized in connection with promotional campaigns and with efforts to oppose continuation of the prohibition on the baiting of waterfowl for shooting.

Several instances of alleged starvation in different parts of the country were thoroughly investigated, examinations of birds collected being made by the Biological Survey, State universities, and other agencies. In each instance the birds affected were cripples from the hunting season, were heavily parasitized, or were suffering from lead poisoning. The last-named diagnosis was the most frequent finding of the technicians conducting the examinations.

In the Illinois River valley, 41 ducks, supposed to have died of starvation, were given a critical laboratory examination, and 20 were found to have died from lead poisoning. The remaining 21 birds had died from other causes, but many showed the characteristic lesions of lead poisoning. Of these, 8 were heavily infested with internal parasites, 3 were suffering from gunshot wounds, and 7 of the remaining 10 had a considerable quantity of corn, small grains, and other food in their gizzards--a circumstance definitely eliminating starvation as the cause of death.

An investigation made on Round Lake, near Ruthven, Iowa, by the Biological Survey in cooperation with the State Conservation Commission showed that about three-quarters of the 123 dead mallards found on the area had food in their crops. About a fifth of the gizzards bulged with food, but this could not be digested because of paralysis of the muscles from lead poisoning. All but one of the 123 ducks contained shot. Although one gizzard contained 22 pellets, 55 others showed but one shot each.

These studies in Illinois and Iowa support findings of wildlife pathologists in other parts of the country, where in many winters reports of starving ducks have been common. In nearly every case wildlife technicians found that causes other than lack of food have been responsible for the condition of the birds.

Nevertheless, starvation may be the immediate cause of death for ducks that are incapacitated by wounds, lead poisoning, or parasites. For birds that might make complete recoveries under moderate weather conditions the freezing of water areas, with accompanying deep snow, may well mean death by starvation. Many wildlife experts have reached the conclusion that normal wild ducks or geese are not likely to die of starvation. It is becoming increasingly evident that the ducks that starve are those badly injured or too weak from other causes to leave an area that suddenly becomes inhospitable, or that are unable to withstand the severe weather conditions prevailing for short periods nearly every winter in the northernmost parts of the waterfowl wintering grounds.

During severe cold spells, when tens of thousands of ducks are concentrated in small open bodies of water, it would be almost miraculous if a few dead birds were not found. Some of these may be individuals that have lived through a normal span of life or that are otherwise unfit, and it is natural for them to succumb during critical periods.

Cripples

The annual loss of crippled or unretrieved birds is a very serious drain on our waterfowl. Although this is to some extent unavoidable and is sometimes caused even by expert shooters, a large percentage is the result of attempts to bag birds beyond the effective range of the gun. The following quotation from an article by H. P. Sheldon, in *Country Life* (Feb. 1940) is illustrative:

"Few duck shooters can go through a season without having cause for self-reproach over the number of crippled birds that are not recovered. Even if a gunner is utterly indifferent to the humane aspect of the matter he cannot ignore the fact that it is dreadfully poor business to allow one-fourth of the total annual kill of wildfowl to be wasted in such fashion. One way to avoid crippling is to use these modern heavy shot loads properly--not in attempts to make long-range hits, but to produce cleaner kills at normal ranges. I wish with all my heart that there could be less talk about the long-range qualities of these cartridges. Every word of it adds to the numbers of the poor broken-winged, gun-shot creatures dying in their thousands back in the willows and sedge, out of sight and too often, I fear, out of the minds of the men who put them there. God knows there is little need to encourage the average duck hunter to try a long shot. On any day on any ducking ground one will see incorrigible optimists firing long-range cartridges at birds at distances of from 30 yards to infinity. It's a lamentable and scandalous fact that most of these lads are not too hot at the 30-yard birds, but they will nevertheless dauntlessly undertake to bet a 3-inch 5-cent shotgun shell against the life of a wild duck 80 yards distant. Just often enough to support their egos and back up the advertising claims they'll kill a 70-yard duck dead in the air, having missed a few, and hopelessly crippled a few more that could not be gathered afterward.

"I feel that I have an extra-moral privilege to speak frankly on this subject, for in the past I, too, have fired long-range cartridges in a long-range gun at a long-range duck who had nothing to lose but his life or his splendid gift of flight. He had, perhaps, burst his shell well beyond the Arctic Circle on a night when the Northern Lights were sweeping long fingers of cold mysterious fire across the firmament. He saw that, and later he saw the length of a great continent flowing past and beneath his wings. The Great Slave Lake, the Touissant Marsh where the slow stream of that name empties into Erie; Currituck Sound; the canebrakes, bayous, and piney woods of the Deep South, and a winter on a shallow coastal lake in Louisiana. Then northward again to the Circle with a mate, and southward again, until one morning on Mattamuskeet a far flung pellet of number-four shot smashed the delicate articulation on his right wing and brought

him down to skulk helplessly amid the cattails until a mink found him finally. We're not cruel, but we are most damnably thoughtless. The people who write the advertisements do the wildfowl and the sport of wildfowling a great ill service by suggesting that anyone can kill ducks at 65 or 70 yards if he has a pocket full of long range cartridges. It can be done with a good gun and a good man to point it, but the skill required doesn't come in the box with the cartridges. It can only be attained with much practice. I don't believe anyone should be allowed or encouraged to practice on live wild creatures when it means that for each one killed and bagged and counted in the legal limit others will be left to die in misery and terror.

"To my mind the expert wildfowler and exemplary sportsman is he who waits until his birds are well in range, so that if one is crippled a quick second barrel will wipe out the worst consequences of the blunder. . . .

"It happens occasionally in upland shooting that a bird is hit too hard and messed up and mangled so as to be unfit for the table. It is a rare occurrence in wildfowling, however, and the circumstance surely indicates that whatever the improvements are in arms and ammunition for goose and duck shooting they may be more sensibly and humanely used to kill birds that are well in range than in ways that only serve to extend the crippling distance.

"It is argued that the regulations forbidding the use of bait and live decoys makes it necessary for the gunner to shoot at long-range birds, because without those attractions to draw them the ducks will not come into the blind. Undoubtedly there is much truth in the claim that the birds do not decoy as well to a baitless stand and wooden blocks as they do to a heap of corn and live decoys, but the issue should not be confused. One concerns a shooting regulation intended to reduce the total number of birds killed so that the annual production will be in excess of the number taken. The other concerns a question of individual conduct and the responsibility each one of us has to decide whether, in the pursuit of sport, he is justified in shooting down many birds that will be lost and wasted for the sake of getting a few. After all, there is no law compelling a man to shoot ducks.

"Only a few days ago I heard a professional guide urging his paying guest to try the high birds that were coming 70 yards over the blind. The blind itself was built into the edge of an impenetrable tangle of rushes, water brush, and cattails which made the recovery of a crippled bird practically impossible.

"'Might as well shoot at 'em,' said the guide. 'The season will be over in a couple of days, so it won't make no difference any way, and you've got plenty of long-range ca'ttridges.'

"A good part of the guide's annual income depended upon his duck blinds; the duck blinds would be useless unless maximum numbers of wildfowl came to that area year after year; yet the man saw only that with

but one day or so of the season left there wouldn't be time for the harrying and crippling of high-flying fowl to make the birds 'blind wise' and spoil his stand for the remainder of the season. The guide, of course, was shortsighted and selfish, but not more so than the gunner who will follow such advice, or of his own initiative fire into distant birds when common sense informs him that chances are all against a clean kill.

"Honest men are gratified when a gang of market shooters is broken up and put out of business, and justifiably so, yet many times, when we take a long chance that results in a bird skidding down out of sight and beyond hope of recovery, we add to a loss which, in its seasonal total, exceeds by millions the numbers killed by poachers and market shooters."

Natural Enemies

From time to time certain animals are extensively publicized as the cause for the decrease of game species. It is obvious that a hawk, owl, coyote, fox, mink, or other flesh eater may occasionally enjoy a dinner of duck or goose, "even as you and I." Nevertheless, actual bona fide instances of their so doing are extremely rare. Locally the common crow can, and does, do much damage to nesting waterfowl, and occasionally the depredations of large fishes, turtles, snakes, skunks, gulls, and jaegers may assume some importance in the loss of eggs and downy young, but the evidence available does not in any way justify the classification of these forms of wildlife as "vermin." Nowadays, by a rather curious perversion, this term is used by many to include all animals that sometimes might kill another animal that man himself desires to kill.

With this thought it is gratifying to cite a report by J. A. Munro entitled "The relation of loons, Holboell's grebes, and coots to duck populations" (Journal of Wildlife Management 3: 339-344, October 1939). Munro not only is an ornithologist of note but also Chief Federal Migratory Bird Officer for British Columbia. All the birds mentioned in the title of his article have been accused of killing ducklings. The study was conducted in the Cariboo region of British Columbia during the three summers 1936 to 1938, and a total of 428 inspections were made of 108 waterfowl areas. The finding was that there is no appreciable difference in the size of the broods of ducks when loons, Holboell's grebes, and coots were present and when they were absent. Munro concludes with the comment: "While it seems likely that some mortality can be attributed to attacks by loons, Holboell's grebes, and coots, this is undoubtedly casual or sporadic, and does not represent a serious drain on waterfowl production."

PART 2: OTHER MIGRATORY GAME BIRDS

Woodcock

Numerically, woodcock hunters are far below those who hunt for ducks and geese. This is fortunate, as the "timber doodle," like other shorebirds, is single-brooded, nests on the ground, and lays only four eggs. Its

nesting preferences subject it to many natural enemies and to the vagaries of weather conditions. It has a somewhat limited range, chiefly east of the Mississippi River. Although known to breed in Louisiana and other southern States, most of the birds are produced on nesting grounds in Pennsylvania, New York, New England and the Maritime Provinces. It is an anomaly of distribution, probably not generally known, that during the winter months this species is heavily concentrated in Louisiana and western Mississippi. A few may be found at that season also in Florida, Georgia, the Carolinas, and even as far north as the Potomac River, but probably as much as 75 percent of the population is concentrated in the lower Mississippi Valley. The situation is parallel to that of the blue goose, and Louisiana is the custodian of both these valuable species in winter.

The fall flight of woodcock, in 1939, was good and it appeared that the supply of birds was up to, or even above, the average for the past few years. Then came the abnormal weather conditions of January 1940, with snow and freezing weather extending deep into the South, even to the Gulf coast. In southern Louisiana the ground was reported frozen in many places to a depth of 3 inches, and this condition persisted for 10 days or longer. For a bird that obtains its food by probing in soft ground these conditions could only prove disastrous. Unfortunately, this occurred at the time of the open season in that State, January 1 to 31. As a result, in addition to untold numbers of birds that unquestionably died of starvation, hundreds were killed in bag limits by hunters. When they learned of the condition of the birds, many sportsmen refrained from further shooting, but many others, disregarding the ethics of sportsmanship, continued day after day to shoot the weakened birds. While Federal game-management personnel was not adequate to cover the entire area, biologists of the Survey, game-management agents, and the regional director concentrated their activities in Louisiana. Very little of the killing was found to be illegal, although reports were received that the birds were being sold on the streets.

It was obvious, however, that the loss was very heavy, and as the northward migration got under way all field personnel of the Bureau were instructed to maintain a close watch and to report their findings. Reports to the number of 72 were received from the Atlantic and Mississippi Flyways. Only 9 of the observers could detect any increase over the spring flight of 1939, while 29 reported decreases, usually heavy. The remaining 34 observers could detect no change but, significantly, most of them are situated in areas where the species is never common.

Particularly important are the May reports from the cooperative research stations in Pennsylvania and Maine, where the woodcock is a major subject of investigation. The breeding grounds studied by these units showed decreases of 40 and 37.5 percent, respectively, under the populations of 1939. The biologist of the Atlantic Flyway, working in New Brunswick, Nova Scotia, and Prince Edward Island, reported a somewhat reduced population in that important breeding district.

In a few areas, notably in New York, reports were received of normal numbers of woodcock. It cannot be denied, however, that the 1940 breeding population of this species has been reduced through a combination of hunting and abnormal weather conditions.

Mourning Dove

While open seasons are provided on the mourning dove in several States, the bird is important as a game species only in California and the South, particularly in the latter region. Doves are difficult subjects for proper administration because they are multi-brooded and because the number of broods in the southern part of the range increases with a breeding season that extends from March or February to October. In fact, eggs are laid every month in the year, with the possible exception of November.

For many years it had been the practice to open the season on mourning doves on September 1. Investigations at the cooperative research station in Alabama, and elsewhere in the South, furnished abundant evidence that this early opening date was the poorest kind of management, since nesting is active during this month over most of the southeastern region. Pending completion of investigations in the northern part of the section, it appears that the shooting season should not open before October 1 for all areas south of the 36th or 37th parallels.

Studies of the movements of the species show that, while large numbers of western mourning doves regularly migrate well into Mexico, the eastern form does not leave the United States in winter but is heavily concentrated in the Southeastern States. This being the case, it will be readily understood that these birds were particularly vulnerable when the severe weather conditions of January struck deep into the South. Actually, mourning doves were affected as severely as any other species, much more so than most birds. Literally thousands of dead doves were found, apparently victims of starvation and cold.

Field personnel were accordingly instructed to survey and report on the situation in their respective districts. The study was nation-wide in scope, and more than 150 reports were received for analysis. As expected, these showed the greatest losses to be in the Atlantic and Mississippi Flyways, the number reporting decrease being 27 as against only 8 noting even a small increase. The situation in the Central and Pacific Flyways (western subspecies) was much better, the populations being about normal, with a slight gain reported in the Pacific Flyway.

On April 23, 1940, at a conference at Charleston, S. C., with the heads of conservation departments of most of the Southeastern States, the Bureau made arrangements for regulatory action that will probably greatly improve the management of the mourning dove in the Southeast. In a few States to the north and west, the situation needs improvement and this will be attended to as soon as adequate information is available.

Other Species

Coot

The lowly coot, or "mudhen," should be a more popular game bird. When properly prepared it possesses good flavor and when fairly on the wing it has a flight speed that will test the skill of the marksman. Ranging from coast to coast, laying large sets of eggs, and suffering less from hunting, this species continues to increase at a rate that is disproportionate to that of the more generally preferred types of waterfowl.

Sora

The problem of obtaining precise information regarding the population status of any of the rails is difficult. It is known, however, that in recent years great areas in the habitat of the sora have been destroyed through drainage, chiefly for the control of mosquitoes. This cannot help having an adverse effect upon the rails as well as upon other forms of life dependent upon marsh associations.

Wilson's Snipe

At the time of the January freeze in the Southern States, it was feared that the "jacksnipe" also was being severely affected, and a few birds were found that had apparently succumbed to the prevailing adverse weather conditions. All field personnel were, therefore, instructed to watch the spring migration closely and report any deviations from normal. The Wilson's snipe has an extensive breeding range, nesting northward to Alaska, Mackenzie, Labrador, and Newfoundland. With the exception of the Pacific Flyway, for which available information indicates an increase, reports of decrease exceed those of increase for the entire country. Analysis of the data does not, however, indicate that the situation is at all serious, but it is one that must be closely watched. Drainage has destroyed much habitat of the jacksnipe also and the bird is by no means so abundant as in the past.

White-winged Dove

The white-winged Dove is a subtropical species that is found commonly in the United States only in the lower Rio Grande Valley and in the Southwest, where two subspecies (eastern and western) are represented. The birds came under Federal jurisdiction with ratification of the treaty with Mexico for the protection of migratory birds. As game, they are of interest only in Texas and Arizona.

Early open seasons, once nearly in midsummer, were formerly permitted in the belief that these doves had an early migration, because of storms, that took them out of the country. During the past three years the problem has been intensively studied in Arizona by Johnson A. Neff, a biologist of the Survey, and more recently it has been possible for George B. Saunders, the biologist of the Central Flyway, to make investigations in Texas.

From the work in Arizona it appears that in favorable localities this dove may be double-brooded, but that elsewhere it has only one brood. Because of its flocking habits, the species is extremely vulnerable and, quoting from Neff's latest report: "Shooting is considered to be the major cause of early August migration or movement, rather than storms." This opinion was further confirmed by his observations in one or two localities favorable to the birds, where no shooting occurred until August 22 (the 1939 season opened August 1). At these points the population steadily increased from about 200 to more than 2,000 birds. He also stated that, in his opinion, a young white-winged dove that has not been out of its nest for at least 4 or 5 weeks does not afford a sporting target. It is interesting to note the following comment in a report from a game-management agent of the Biological Survey who was operating in the vicinity of Yuma, Ariz., when the 1939 season opened: "On the opening day I checked 23 hunters with a total of 197 white-winged doves, of which 157 were young birds and 40 were mature."

Although the territory frequented by these birds is normally more or less desertlike, its aridity has been accentuated in recent years by severe drought. The situation in 1939 was most unsatisfactory, with the natural wild foods of the whitewing nearly a complete failure over much of the bird's range and fruiting or seeding only in favored and isolated localities. According to Neff, "In some areas the oak trees were completely defoliated excepting on the canyon floors. Even the mesquite bean crop was sparse and erratic. Cattle and deer died for lack of food and water in some localities." He concludes that in 1939 "the whitewing in Arizona was in a serious condition, with greatly depreciated population, with the success of its 1939 nesting season generally in doubt, and with shooting continuing to be heavy on every small flight within reach."

Conclusions are not yet possible regarding the status of the eastern white-winged dove in southern Texas, but a recent report from Saunders indicates that the actual production of young by a pair of adults is disappointingly small. It appears that this species is unusually susceptible to nest raiding by several natural enemies that, if general throughout the breeding range, can effectively reduce the crop for sporting purposes. In the light of our present knowledge it is obvious that the future of the white-winged dove, as a game bird with an open season, may be considered doubtful.

Band-tailed Pigeon

It is only on the Pacific coast that the band-tailed pigeon is found in sufficient numbers to be important as game. It is, however, locally plentiful in the southern Rocky Mountain region. The species breeds north into British Columbia and in that Province there is some evidence that it is decreasing. On the other hand, reports show that bandtails are at least holding their own, or are even increasing in Oregon and California, and similar reports have been received from Arizona and New Mexico.

CONCLUSION

Because of improved habitat conditions and strict enforcement of shooting regulations, satisfactory increases are recorded for almost all species of ducks and geese. The January inventory indicates that the continental population of these birds is about 65,000,000, nearly two and one-half times the size of the stock in 1935. The increases are chiefly in the Atlantic and Mississippi Flyways, with the Central region showing a loss and but little change in the Pacific Flyway. The mallard and pintail show the largest gains, that for the canvasback is considered satisfactory, but little change is detected in the status of the redhead. A slight decrease is recorded for the black duck. Canada geese also made a gratifying gain, although much of this was lost through excessive shooting.

During January 1940 adverse weather conditions in the Southeast, coupled with legal hunting, made serious inroads into the numbers of woodcocks and mourning doves, with the result that the numerical strength of both species is much below that of 1939. Measures to restrict the kill during the forthcoming season are definitely indicated.

The continued status of the white-winged dove as a game species is open to serious question, not only because of improper management in harvesting the crop but also of natural factors that endanger the stock.

So far as can be determined, the status of the band-tailed pigeon and the Wilson's snipe is satisfactory for the present year, but both species must be watched to guard against undue depletion.

Experiences of the past few years abundantly demonstrate that the sport of hunting migratory-game birds can be perpetuated under sound management, and if there is no return to methods of shooting that have proved unduly destructive.