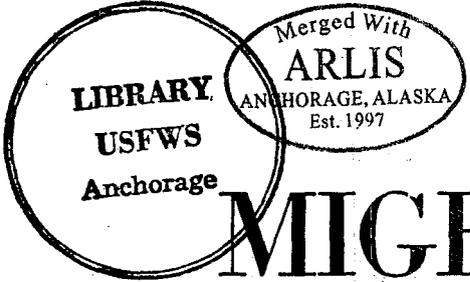


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REDHEAD
DUCKS



MIGRATION OF BIRDS.



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The migration of birds usually refers to the regular flights between their summer and winter homes. Except for those that nest in the tropics, nearly all North American birds migrate, some great distances while others only a short way.

This seasonal movement has long been a mystery to man. Aristotle, the naturalist and philosopher of ancient Greece, noticed that cranes, pelicans, geese, swans, doves, and many other birds moved to warmer places to spend the winter.

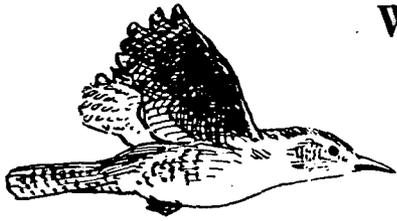
But, like others of times past, he started superstitions that were believed for hundreds of years. For example, Aristotle thought that many birds spent the winter sleeping in hollow trees, caves, or beneath the mud in marshes.

Probably the strangest idea as to where birds go in winter is found in a statement by Cotton Mather, a minister who lived in New England at the turn of the 16th century. He said, "The wild pigeons on leaving us repair to some undiscovered satellite accompanying the earth at a near distance."

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Why Do Birds Migrate?



HOUSE
WREN

As with most aspects of migration, there are many theories about why. Many scientists believe that birds migrate north to south because of inclement weather. Supposedly, these birds began this journey originally because they were driven southward by the advancing ice age.

Many birds feed almost entirely upon insects, so another theory holds that birds migrate to areas with plentiful insects. When winter sets in, insects, of course, disappear and the birds would starve unless they moved southward to warmer climes. You may wonder, however, why insect eaters fly north again with the coming of spring, when there are many insects at winter homes.

A more realistic theory holds that birds have an "imprint" or lasting impression of the birth place, resulting in a lifelong urge to return to this locale each spring.

Scientists have recently found that length of day is the triggering force that prepares many birds for their migratory journeys. The change in length of day brings the birds into breeding condition and causes them to seek their northern nesting grounds.

When Do Birds Migrate?

In North America, it is possible to see migrating birds almost every month of the year. Some birds start south early in July, while others remain north until pushed out by either severe weather or shortage of food. Soon after hardy travelers reach winter homes, other equally hardy migrants start north on the heels of winter. In their eagerness to reach northern nesting grounds, early spring migrants sometimes crowd the retreating winter a little too closely and are caught in sudden storms and of course some perish.

Most small birds and a good many larger ones migrate by night. This may sound strange since most seem helpless in the dark, but there are good reasons for this nighttime travel. Some are poor fliers. Even good fliers can fall easy prey to hawks, which feed and migrate in daylight. Also, night migrants have daylight hours for feeding.

Many kinds of wading and swimming birds migrate either by day or night. Such birds usually feed at all hours and rarely depend on hiding to escape enemies.



ROBIN
EARLY SPRING



Day migrants include, in addition to some of the ducks and geese, loons, cranes, gulls, pelicans, hawks, swallows, nighthawks, and swifts. All these are strong-winged birds. Swifts, swallows, and nighthawks feed on flying insects and can easily pick up a full course dinner as they travel. Gulls, hawks, and pelicans feed so heavily when food is available that to miss a meal now and then causes little hardship.

Migrations of blackpoll warblers and cliff swallows are samples of differences between routes of day and night migrants. These two birds winter as neighbors in South America. When northward spring migration starts, warblers, traveling at night, head north across the Caribbean Sea and the Gulf of Mexico and into the United States. Cliff swallows, traveling during daylight hours, move westward through Panama, up the western slope of the Caribbean Sea to Mexico, and then around the Gulf of Mexico into the United States.

How Fast Do Migratory Birds Travel?

Migratory birds do not travel as fast as some people have believed. A German scientist in 1895, for example, attributed speeds in excess of 200 miles an hour to some birds during migration, but later investigations indicated this estimate was much too high. It is true that the peregrine falcon flies 165 to 180 miles per hour while pursuing food, but very few birds can even approach this.

Birds have two speeds—one for normal flying including migration, and a faster one for escaping enemies or pursuing food. Most songbirds have cruising speeds between 25 and 50 miles per hour during migration.

Scientists making studies of the amount of fat lost by migrating birds are convinced that migration often consists of a series of single, long flights, followed by feeding for several days to replenish fat needed for the next stage of the journey.

How High Do Migrating Birds Travel?

At one time it was thought that migrating birds traveled at heights above 15,000 feet because flying was easier high up. Lack of oxygen and of buoyancy in the rarified air, however, would handicap such high altitude flying.

Birds such as vultures, pelicans, cranes, and some of the hawks feel this lack of buoyancy least since their wing surface is very great in comparison with body weight. But smaller and shorter-winged birds do not have this buoyancy at high altitudes. Even when flying close to the earth, small birds have to keep their wings beating rapidly to stay airborne.

Observation from towers and by radar and airplanes indicate that most birds travel below 5,000 feet above the earth during migration.



WOODCOCK
LATE FALL



GREEN-
WINGED
TEAL



PEREGRINE
FALCON

GOLDEN-
CROWNED
SPARROW



TURKEY
VULTURE



BROWN
PELICAN

How Do Migrating Birds Keep On Course?

Perhaps the most mysterious aspect of bird migration is navigation. The old idea that birds have a mysterious "sense of direction" or some sort of built-in compass has been discarded by most modern scientists, but in place of this theory there are a host of others with their advocates and evidence to support them.

Some scientists, for example, believe that many birds navigate by the sun and stars. This would account for amazing treks across vast stretches of ocean.

But other scientists believe birds use familiar landmarks to guide them. Veteran fliers who made the trek before "educate" young followers on the journey to nesting or wintering homes.

Still other scientists say birds can navigate by way of subtle differences in the magnetic field of the earth. This theory would endow young birds with subtle receptors that can detect differences in field strength.

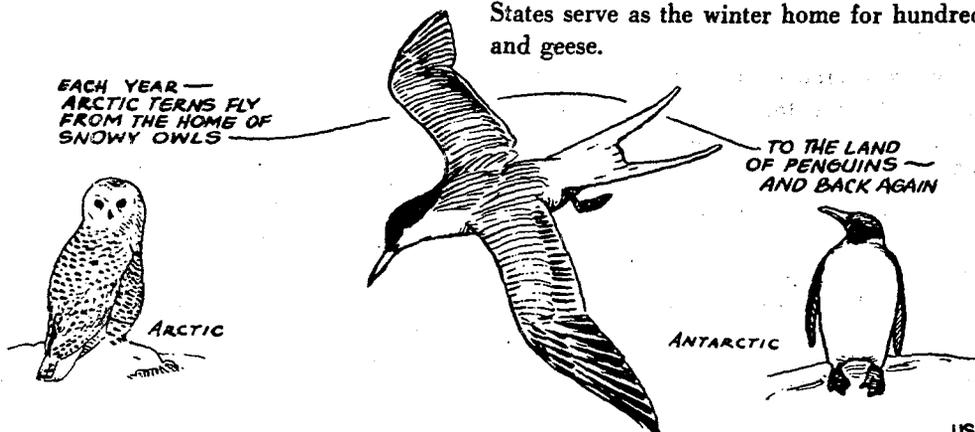
One of the most amazing things about migration is that some birds brought up away from their parents and without adult guidance or experience in actual migration can orient to the proper direction across vast stretches of water.

It is thus obvious that most theories on navigation apply only for some birds and under certain conditions. Migrating birds traversing oceans could guide their journey by way of heavenly bodies, but many birds following land routes could guide their treks by familiar land objects. Much more research is needed before we can say what theory applies for each migrating bird.

How Far Do Birds Migrate?

Birds like bobwhite quail and cardinals never get more than 10 miles from the nest where they were hatched, but arctic terns are true globetrotters. These birds nest in Greenland and the northern part of North America, with a few found as far south as Massachusetts. As soon as the young are grown, those from eastern North America cross the Atlantic Ocean to Europe and a few months later can be found in the Antarctic regions, 11,000 miles from their nesting grounds. They fly at least 25,000 miles each year in migrating.

Most North American birds, however, spend winters in southern United States and Central and South America. Coastal marshes along the Gulf of Mexico and along the South Atlantic coast of the United States serve as the winter home for hundreds of thousands of ducks and geese.



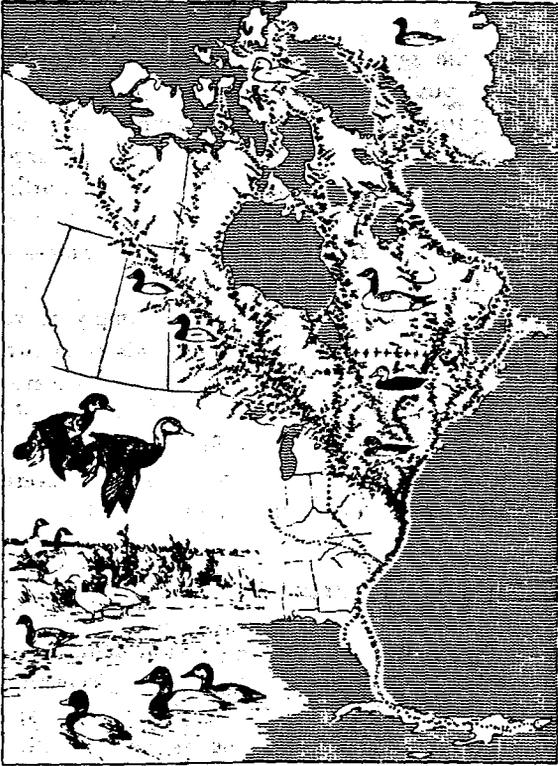
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Waterfowl Flyways of North America

ATLANTIC FLYWAY



MISSISSIPPI FLYWAY



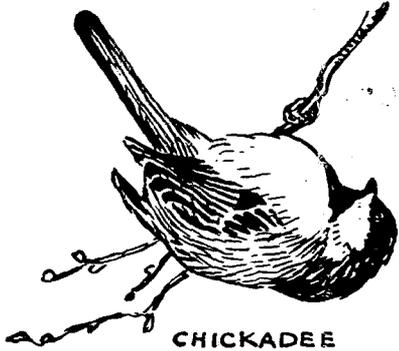
CENTRAL FLYWAY



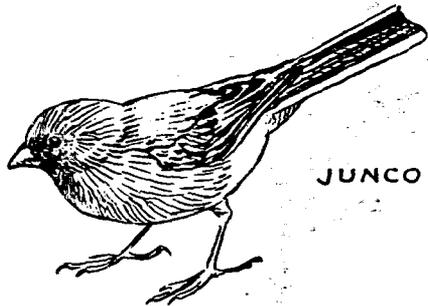
PACIFIC FLYWAY



Migration Routes



CHICKADEE



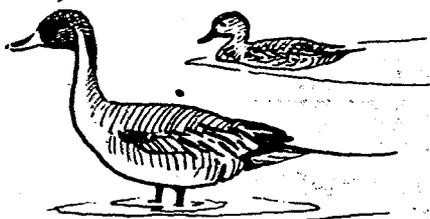
JUNCO

Migratory birds generally follow north-south routes in the United States. They may veer east or west, but their movement in the end is southward.

Most waterfowl follow the same approximate route each spring and fall. Probably in no other region of the world does such a large proportion of the birds migrate north and south as they do in North America. The outlines of the coasts, the courses of large rivers, the trend of mountain chains—all combine to make northward and southward migration easy and natural. These routes are known as flyways, and there are four in the United States—Atlantic, Mississippi, Central, and Pacific.

But some birds that nest in high mountain areas simply move down to the warmer lowlands to spend the winter. This is known as vertical migration. In such cases, a few hundred feet in elevation corresponds to a flight of hundreds of miles. Only such hardy birds as the harlequin ducks, chickadees, rosy finches, juncos, and a few others make such migrations because winters are still severe in most lowland areas near larger mountain ranges.

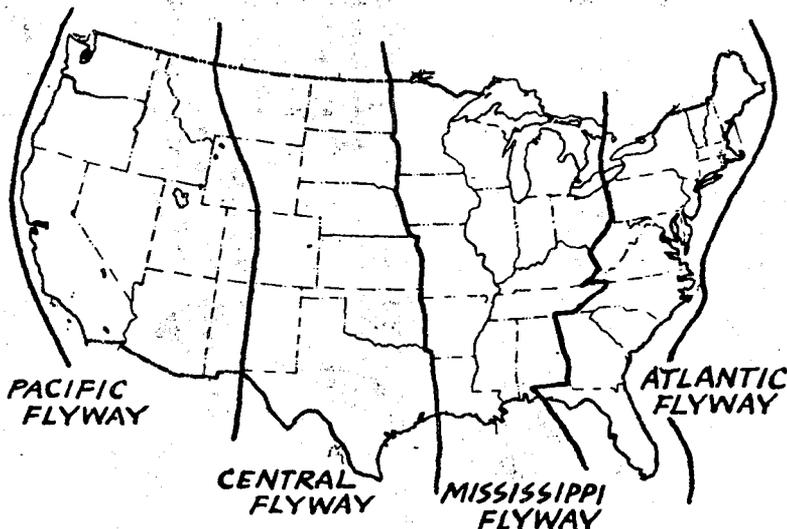
Protection of Migrating Birds



PINTAIL
DUCKS

Our feathery friends do not recognize man's political boundaries, traveling across both international and State borders. Protection of these birds within the United States is in the hands of the Department of the Interior's Bureau of Sport Fisheries and Wildlife. Treaties with Canada and Mexico extend protection throughout the North American Continent. Nearly all migratory birds are protected by Federal law, and a corps of Federal game management agents and cooperating State conservation officers enforce these laws.

Protective laws regulating hunting of ducks and geese are established according to flyways. But rather than follow indefinite boundaries, so-called legal or regulation flyways follow State lines, with the exception of the boundary between the Central and Pacific Flyways which follows the Continental Divide.





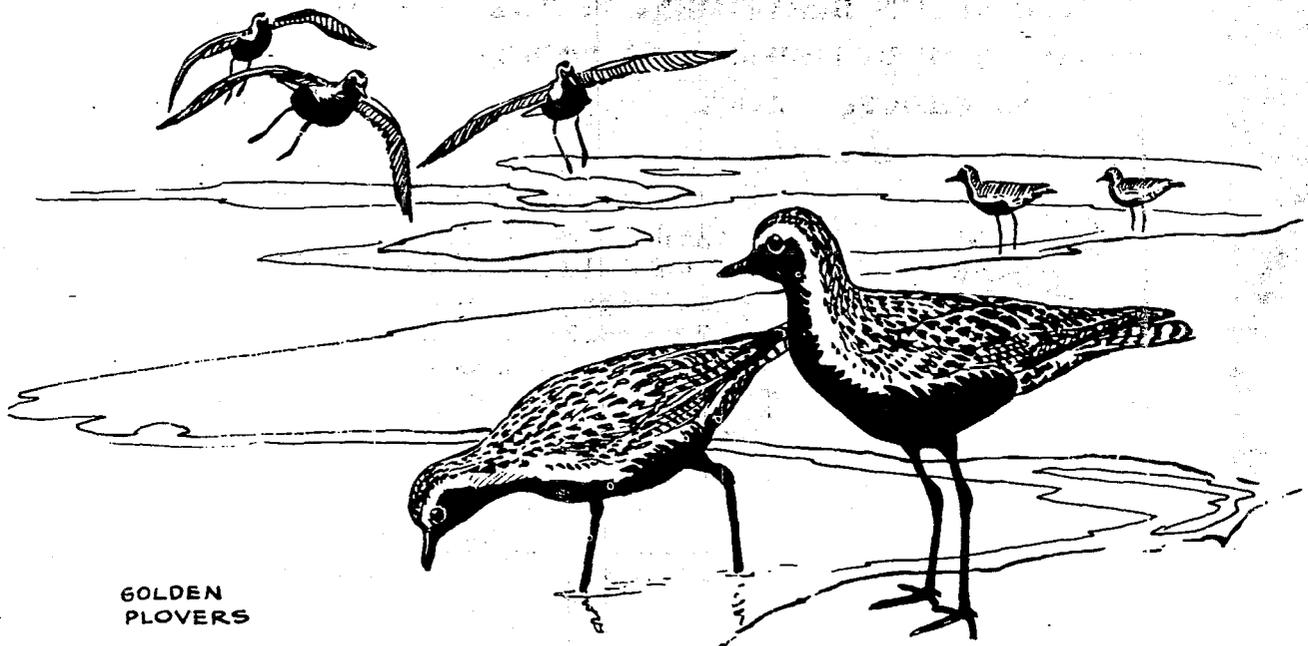
Dangers During Migration

Many perils are faced by migrating birds during their long journeys. Aerial obstructions such as television or radio towers and monuments are responsible for the deaths of thousands each year. Planes landing and taking off at airports and airport ceilometers are also dangerous for birds flying at night because some are attracted to the light during foggy weather.

The famous Washington Monument in our Nation's Capital, which is illuminated by powerful searchlights, kills many birds, especially when gusty winds and low cloud cover prevail. The Statue of Liberty, when the torch was kept lighted, caused enormous destruction of birds.

Storms also kill many birds, particularly the smaller ones. Inland hailstorms kill great numbers. Those traversing large stretches of water are sometimes forced down and drown.

But birds like the sandpipers, plovers, and terns are well-adapted for long overseas flights. For example, the golden plover, traveling the Atlantic oceanic route from Nova Scotia to South America covers the entire distance of 2,400 miles without stopping and although considerable fat is lost, the bird seems little worse for wear as a result of its journey.



GOLDEN
PLOVERS

A Center for Migratory Bird Data

Banding—the marking or attaching of identification tags to individual birds and other kinds of wildlife—has been responsible for scientists determining many routes of migration. This technique, which began in Europe by amateur naturalists who were curious about the movements of individual birds, was later picked up along with data by biologists.

There are several dozen banding centers throughout the world, but we in North America are fortunate to have a facility where much of these activities can be coordinated. This is the Interior Department's Bird Banding Laboratory located near Laurel, Maryland. In cooperation with the Canadian Wildlife Service, this Bureau of Sport Fisheries and Wildlife center coordinates the banding activities of about 4,000 professional and amateur ornithologists throughout North America and several foreign countries.

To this station hunters and others send bands they find on birds and facts of recovery to help scientists get a better picture of the population dynamics and migration routes of birds. Thousands of recoveries come in each year—so many that the center's scientists use electronic computers to keep track of information.

Summary

Bird migration had its start such a long time ago that it is only possible to speculate how it all began. Some aspects of migration, particularly routes of travel and time of year of journeys for many species have been worked out largely through banding efforts and observations from planes, radar, and miniature radio transmitters. Interested observers and laboratory experiments have also contributed to the growing fund of knowledge. But much of bird migration is still a mystery for future generations of scientists and amateur naturalists to explore.

**UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF SPORT FISHERIES AND WILDLIFE
FISH AND WILDLIFE SERVICE**

WASHINGTON • ISSUED 1971



As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of this department of natural resources.

The Department works to assure the wisest choice in managing all our resources so that each shall make its full contribution to a better United States now and in the future.

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