



Ross's Goose

## THE PACIFIC FLYWAY

### Waterfowl in the Pacific Flyway of North America

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THE Pacific flyway encompasses approximately the western quarter of North America. Between its breeding grounds and wintering areas pass some 10 million swans, geese and ducks each year. In the United States portion of the flyway these birds are hunted by about 450,000 sportsmen and are enjoyed by countless others. The Pacific flyway is one of four flyways recognised in North America. Although many birds pass from one to another, the flyway boundaries generally follow mountain ranges or other geographical features restricting movement between flyways. Waterfowl surveys, research, hunting regulations and other matters pertaining to this resource are carried out on a flyway basis.

This article, using the Pacific flyway as an example, illustrates the activities being carried out with regard to waterfowl in the United States. Mention is also made of the main species of the Pacific flyway and their migration patterns.

### MIGRATIONS, SPECIES AND POPULATIONS

Extensive surveys carried out by Federal and State Governments of the United States, Canadian Government agencies and private organisations have revealed much basic data on the Pacific flyway in recent years. These surveys are designed primarily to serve as a basis for drawing up hunting regulations, which vary from year to year according to populations and conditions. The methods by which these surveys are taken will be described later.

Alaska, southern Alberta and Saskatchewan contribute well over half of duck and goose production of the flyway. Other important breeding areas include northern Alberta and the Northwest Territories; followed by British Columbia and the states of Washington, Oregon, California and Montana. Other states of the flyway, including Idaho, Utah and Nevada, contribute minor quantities of ducks and geese.

Wintering areas and intermediate refuges are just as important to the maintenance of the flyway as breeding grounds. While the ducks and geese of the Pacific flyway nest over a vast region, their wintering areas are most restricted. The state of California winters about 60% of these birds and Mexico about 12%. British Columbia, Washington, Oregon and Idaho combined winter only 25% of these birds, while other portions of the flyway have even less. Many parts of the flyway serve as important midway points between breeding areas and wintering areas. California, however, is the main concentration point for

waterfowl of the Pacific flyway. It is in this state that one may see the most spectacular concentrations of waterfowl in North America.

Some of the species involved are indigenous only to North America, while others are the same as those found in Europe, though different sub-species may be recognised for North America. It is not the plan of this article to discuss the different sub-species found in the Old and New Worlds. However, a discussion of the better-known and common species of the Pacific flyway appears worth while. Table I lists in their order of abundance the most common species of Anatidae in the Pacific flyway as found during recent winter surveys. It will

TABLE I

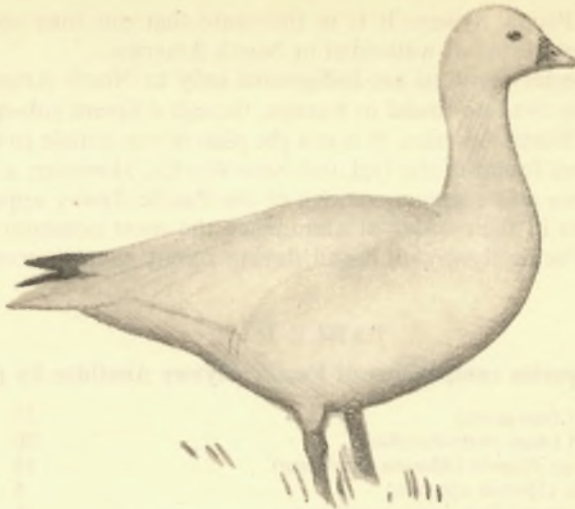
Approximate species composition of Pacific Flyway Anatidae by per cent

Pintail ( <i>Anas acuta</i> )	.. .. .	33
Mallard ( <i>Anas platyrhynchos</i> )	.. .. .	20
American Wigeon ( <i>Mareca americana</i> )	.. .. .	14
Shoveler ( <i>Spatula clypeata</i> )	.. .. .	6
Green-winged Teal ( <i>Anas carolinensis</i> )	.. .. .	5
Snow Goose ( <i>Chen hyperborea</i> )	.. .. .	4
Canada Goose ( <i>Branta canadensis</i> subsp.)	.. .. .	4
Scaups ( <i>Aythya marila</i> and <i>A. affinis</i> )	.. .. .	3
White-fronted Goose ( <i>Anser albifrons</i> )	.. .. .	2
Ruddy Duck ( <i>Oxyura jamaicensis rubida</i> )	.. .. .	1
Black Brant ( <i>Branta nigricans</i> )	.. .. .	1
Scoters and Eiders ( <i>Melanitta</i> , <i>Oidemia</i> , <i>Somateria</i> spp.)	.. .. .	1
Others	.. .. .	6



Fig. 1. Principal waterfowl refuges administered by the U.S. Fish and Wildlife Service in the Pacific Flyway States





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be noted that three species—the Pintail (*Anas acuta*), Mallard (*Anas platyrhynchos*) and American Wigeon (*Anas americana*)—make up almost 70% of the Pacific flyway population. The Lesser Snow Goose (*Anser hyperboreus*) is the most abundant goose. These four species have adapted themselves well to the agricultural areas which have largely replaced natural marshlands. Shovelers (*Anas clypeata*), Green-winged Teal (*Anas crecca carolinensis*) and the Lesser Scaup (*Aythya affinis*) are also doing well. The White-fronted Goose (*Anser albifrons*) and Canada Goose (*Branta canadensis*) are familiar to Britons. These two species are favourites of American sportsmen. The latter species, which is represented by a number of sub-species, is the most widely distributed goose in the flyway, but is nowhere to be found in large concentrations like the Snow, White-fronted and *Branta canadensis minima*, which in the past has been called the 'Cackling Goose'. The last is one of the smallest sub-species of Canada Goose, and one which interests many outsiders inasmuch as it is restricted to the Pacific flyway. Unfamiliar to most Europeans also is the unique little Ruddy Duck (*Oxyura jamaicensis*). Black Brants (*Branta nigricans*), similar to the Brent Goose, are common inhabitants of coastal bays.

Fairly abundant species which fall into the category of others on Table I include the Whistling Swan (*Cygnus c. columbianus*), Gadwall (*Anas strepera*), Cinnamon Teal (*Anas cyanoptera*), Redhead (*Aythya americana*), Canvasback (*Aythya vallisneria*), Common Goldeneye (*Bucephala clangula*), Bufflehead (*Bucephala albeola*) and the Goosander known in North America as the Common Merganser (*Mergus merganser*). Many of these species are found in the Old World. Some of the less abundant species of the Pacific flyway include the Trumpeter Swan (*Cygnus cygnus buccinator*), Emperor Goose (*Anser canagicus*), Ross's Goose (*Anser rossii*), Fulvous Tree Duck (*Dendrocygna bicolor*), Blue-winged Teal (*Anas discors*), Ring-necked Duck (*Aythya collaris*), Barrow's Goldeneye (*Bucephala islandica*), Oldsquaw or Long-tailed Duck (*Clangula hyemalis*), Harlequin Duck (*Histrionicus histrionicus*), Hooded Merganser (*Mergus cucullatus*) and the Red-breasted Merganser (*Mergus serrator*).

The beautiful little Ross's Goose has become a centre of interest in recent years. Upon casual inspection one might mistake this species for a Snow Goose,

but its shorter head and bill, combined with its more petite appearance and behaviour, are distinctive. The breeding grounds of the Ross's Goose in the Perry River region north of the Arctic Circle, almost midway between the east and west borders of North America, are described in an earlier edition of the *Severn Wildfowl Trust Annual Report* (1949-50), under the title 'The Perry River Expedition, 1949'.

A study of the Ross's Goose on its California wintering grounds was initiated during the fall of 1953. Until that time little was known of the wintering status of this species. This goose appears in the Klamath Basin of north-eastern California in mid-October, and a month later begins a gradual southward movement of about 200 miles into the Sacramento Valley. By mid-December most of the Ross's Goose population moves another 200 miles farther south into a grassland area of the northern San Joaquin Valley, where they remain until February and March before returning north. In the Klamath Basin, Ross's Geese associate closely with Snow Geese, both as individuals and in flocks. In the San Joaquin Valley this species becomes somewhat detached from flocks of Snow Geese, so that censusing can be reasonably accurate. An aerial survey taken in February of 1957 disclosed about 8000 Ross's Geese. Utilising aerial photographs, it is felt the survey brought reliable results. In November of 1955 over 5000 Ross's Geese were counted from the ground in one flock in the Sacramento Valley. Such figures as the above reveal that there are far more Ross's Geese than previously were thought to exist, and fears that the species might become extinct have decreased. Unfortunately, the similarity of the Ross's Goose to the more common Snow Goose prevents effective protection for the Ross's Goose.

The Trumpeter Swan, another endangered North American species, is holding its own. Over a thousand of these birds are known to exist.

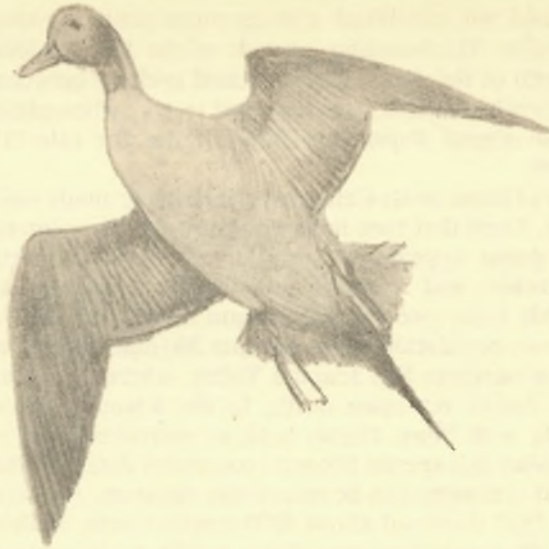
The swans, geese and ducks along with the American Coot (*Fulica americana*) in the United States are classed as game species. At the present time swans are protected because of their relatively low numbers. Most other waterbirds, as well as most of the shorebirds, are also protected by law.

#### MANAGEMENT OF THE WATERFOWL RESOURCE

Ownership of game and other wildlife in the United States is vested with the public rather than the individual landowner. Holding the proper licence, and a migratory bird hunting stamp in case of waterfowl, citizens may hunt according to regulations on public-owned lands of the United States, of which there are many. Most owners reserve the privilege of granting permission to hunt on private lands. In case of waterfowl habitat, which is becoming increasingly scarce in the United States, more and more landowners are leasing hunting privileges to private hunting clubs and individuals. As a result, places for the general public to hunt are becoming increasingly difficult to find. Nevertheless, wild game remains the property of the public, even though this fact does not convey the right to trespass on private lands.

Public ownership of wildlife resources in the United States has required that government agencies be active in the field of wildlife management. Both the Federal and state governments participate. In case of the Federal Government, the Bureau of Sport Fisheries and Wildlife of the U.S. Fish and Wildlife Service, Department of the Interior, by law is responsible for many matters pertaining to wildlife, and particularly waterfowl, because of international





Pintail drake

treaties and the interstate and international movements of this resource. One such responsibility is the establishment and enforcement of hunting regulations. Federal and state governments, the latter through their conservation departments, carry on other work to maintain the waterfowl resources of the nation. Activities pertaining to waterfowl that are carried out by these agencies include enforcement of hunting regulations, making waterfowl surveys, waterfowl research, maintaining waterfowl habitat through a system of refuges and waterfowl management areas, and the operation of public hunting areas. Privately financed organisations also carry on waterfowl work, but their role is not so extensive as in Britain.

Finances for waterfowl work by Federal and state agencies are obtained from several sources: sale of Federal migratory bird-hunting stamps, which hunters must attach to their licences for hunting waterfowl; a Federal tax placed on the sale of sporting arms and ammunition; annual Federal appropriations; the sale of state hunting licences; and state appropriations.

Hunting seasons on waterfowl, bag limits and other hunting restrictions are regulated according to the condition of the waterfowl populations. Extensive waterfowl surveys are required for obtaining these data.

An extensive survey for obtaining this information is the annual winter inventory. For this survey all wintering waterfowl habitat of importance in each flyway is covered simultaneously, in so far as possible. The survey takes place during January, when the birds are most heavily concentrated on their wintering areas and the hunting season is nearly over. In the Pacific flyway areas having low waterfowl numbers are covered by ground observers, while other areas having larger waterfowl numbers are covered from the air. Heavy concentrations of waterfowl in the Sacramento and San Joaquin Valleys of California are covered by use of aerial photographs. Here as many as 100,000 ducks will be recorded by a single photograph. Sample counts are made from each photograph for obtaining an index to the actual number of waterfowl present. A breakdown of the species involved in these concentrations is obtained from another aircraft by visual methods. Coverage of the important or inaccessible waterfowl areas from the air, and ground coverage on other areas, provide tabulations which

show whether the flyway population is increasing or decreasing. The status of each species is also indicated. During the past several years, populations in the Pacific flyway have remained remarkably stable from year to year.

Aerial surveys are made of breeding grounds periodically during the spring and early summer throughout Canada and Alaska by means of censusing transects. The data gathered from these surveys are very important in the setting of annual hunting seasons and bag limits.

The use of aircraft for making waterfowl surveys is relatively new. Experienced waterfowl observers find an aircraft the most efficient way to obtain waterfowl population data on areas of any size. Aircraft are flown from 100 to 300 feet above the ground, except while photographing, when greater altitude is needed. Aerial observations have three main advantages over ground methods. First, they allow the observer to look down on the waterfowl so that each bird can be seen individually, an advantage over a ground view, which at any distance allows the birds to be seen only as a dark mass or streak. An aircraft also permits seeing birds in tall vegetation that blocks the view of the ground observer. A second advantage of the use of aircraft is the vast amount of habitat that can be censused in a given interval of time by only two individuals, the observer and the pilot. The third advantage is in the effective coverage of areas that are inaccessible from the ground. In many instances, a pair of observers in an airplane can do a census job more efficiently than fifty or more ground observers using cars and boats.

Several types of aircraft are used. All are high-wing types giving maximum visibility, and are capable of minimum speeds of ninety miles per hour or less. One of the commonly used types can fly as slow as thirty-five miles per hour. The use of a tape-recorder by the observer allows the recording of observations without interrupting his view of the ground.

Some disturbance to waterfowl naturally results from the use of aircraft. However, this is seldom greater than the disturbance caused by other, usually larger and noisier, aircraft in the vicinity. Similarly, disturbance usually results when the birds are approached on the ground. Considering the vast amount of information that is gathered on waterfowl for their benefit, we do not regard the matter of disturbance as a major factor.

Ringling or banding operations are carried out in the Pacific and other flyways for many of the same purposes as in Europe. Most of the waterfowl banding is carried out by public agencies. During 1955 over 65,000 waterfowl were banded by state and Federal agencies in the United States. Additional birds were banded in Canada and Alaska. The birds are generally captured in one of three ways: by simple portable wire traps which utilise bait; by means of mortar-projected net-traps; and by driving into enclosures during flightless periods. The use of decoys is not practised to any extent, at least in this country. Neither are rocket net-traps used. The American mortar-projected net-trap or boom-trap was described by Peter Scott in the *Fifth Annual Report of the Wildfowl Trust* (1951-52, pp. 72-77), under the title 'The American Boom-trap'. In reviewing these reports, I find the technique of capturing geese by rocket nets has seen more development than mortar trapping in the United States.

During the course of studies on the Ross's Goose, both Snow and Ross's Geese were marked by means of dyes. Though only the wings were dipped, during the course of preening the birds smeared the material over and coloured the remainder of their bodies. After being held in a warm place overnight, the geese were released. The dyes used included a picric-acid solution in alcohol



which gave yellow, and a similar type solution using Rhodamine B which gave pink hues. Green was also obtained from malachite green. The picric acid proved the most lasting and was used on Ross's Geese. The colouring allowed a whole series of observations on these birds, from wintering grounds to breeding areas. It had no apparent effect on either the behaviour or health of the birds.

## REFUGES

The most interesting aspect of waterfowl management in the United States is perhaps its refuge system. Without it the vast numbers of ducks and geese which occupy North America could not exist. Over 270 such public-owned areas, comprising over 17 million acres, are managed by the U.S. Fish and Wildlife Service in the United States, of which more than 200 are waterfowl refuges. Their main purpose is to provide habitat and protection to waterfowl and other wildlife. Additional refuges and waterfowl management areas are operated by the states. In the Pacific flyway there are about thirty waterfowl refuges operated by the U.S. Fish and Wildlife Service which range up to 165,000 acres in size. Most of these refuges have permanent staffs ranging from two to twelve or more in number. The number of state refuges and waterfowl areas in the Pacific flyway is about forty. These areas average somewhat smaller in size than those operated by the Federal Government, but their role is none the less important.

Fig. 1 shows the principal waterfowl refuges operated by the U.S. Fish and Wildlife Service in the Pacific flyway. These refuges have varied functions and programmes according to local requirements. For example, the Red Rock Lakes Refuge in Montana was set aside primarily to preserve habitat and give protection to the rare Trumpeter Swan. The Willapa National Wildlife Refuge provides protection to several thousand Canada Geese of the race *Branta canadensis occidentalis*, as well as other species.

The Malheur National Wildlife Refuge in Oregon includes nearly 100,000 acres of waterfowl habitat, consisting of marsh, meadow and lakes containing submerged waterfowl food plants as well as a limited acreage in grain. This refuge is an important point during the fall and spring migrations. For example, during late March half or more of the Pacific flyway Snow Geese population will be present on Malheur Refuge and adjoining farmlands. Up to 200,000 have been estimated to be present at one time here. Their next major stopping place to the north is five hundred miles away. Species which breed at Malheur in abundance, but which are otherwise in short supply in the flyway, include the Canada Goose, Gadwall, Cinnamon Teal and Redhead. Like so many of the Pacific flyway refuges, the waters of the Malheur Refuge freeze over during the winter months so that most of the birds are forced to move to California.

Many species of birds other than waterfowl use the refuge system. Abundant on many Pacific flyway refuges are such species as the Western Grebe (*Aechmophorus occidentalis*), White Pelican (*Pelecanus erythrorhynchos*), the American or Common Egret (*Casmerodius albus*), Sandhill Crane (*Grus canadensis*), American Avocet (*Recurvirostra americana*), Wilson's Phalarope (*Steganopus tricolor*), Forster's Tern (*Sterna forsteri*) and many others. The refuges attract many people who simply come to enjoy and photograph the birds, a source of recreation which is encouraged.

Most of the refuges contain an intricate system of dikes, canals, and water-

control structures for distributing and managing water at desired levels so far as the availability of water will permit. By the manipulation of water-levels, controlled livestock grazing, the encouragement or discouragement of Muskrats (*Ondatra zibethica*) and the employment of other natural and artificial factors, every effort is made to maintain the habitat at optimum conditions for waterfowl. Undesirable plants are discouraged and desirable species are encouraged. Plant ecology is thus the basis for many important aspects of refuge management. A problem which exists on almost every western refuge is retarding the encroachment of thick strands of cat-tail (*Typha* spp.) and hardstem bulrushes (*Scirpus acutus*) from open-water areas containing desirable species such as sago pondweed (*Potamogeton pectinatus*). The latter plant is perhaps the most important natural waterfowl food plant in North America. Tall emergent cover plants, such as bulrushes and cat-tail are used little when grown in large, unbroken stands. Since the amount of natural waterfowl habitat left in the Pacific flyway is only a fraction of what formerly existed, every effort is being made to make existing habitat on the refuges more productive than would be possible if these areas were left under natural conditions.

The Klamath Basin, an area which was formerly marshland and lakes but has since been largely reclaimed for agricultural purposes, lies in north-eastern California. During October half or more of the Pacific flyway waterfowl population will congregate on the Tule Lake and Lower Klamath National Wildlife Refuges in this area. This presents one of the great waterfowl spectacles of the world, as 5 or 6 million waterfowl will be present here at one time. To offset the loss of former waterfowl habitat in the Klamath Basin, these two refuges are managed intensively. Ninety-two miles of dikes impound marsh and lake waters for the production of natural food plants. In addition, refuge personnel are engaged in an extensive farming programme, as the 24,000 acres of natural habitat cannot feed adequately the large numbers of birds which visit the area. Cultivated crops are mostly barley (*Hordeum vulgare*). Croplands of private farmers adjoining the refuges are also largely in barley. Refuge barley serves two purposes. It not only feeds the birds but also prevents a serious economic loss to farmers by controlling bird damage to their fields. Through scaring devices employed by the farmers, the birds soon learn which barley is intended for their use. Around 7000 acres of grain are left unharvested for the birds each year on the Tule Lake and Lower Klamath National Wildlife Refuges. This grain is fed upon mainly by Pintails, Mallards, Snow Geese and White-fronted Geese.

Agricultural crop depredations by Coots at times becomes an important problem in the interior valleys of California. One of the most abundant migratory game birds in the Pacific flyway, Coots feed on young barley and other green food material in farming areas, and on more northern locations compete directly with waterfowl for sago pondweed and other aquatic plant foods.

As is now the case with many of the national wildlife refuges, parts of Tule Lake and Lower Klamath are open to public hunting during the regular waterfowl season. This area attracts hunters from many parts of the western United States. Portions of these refuges, which were in part financed through sale of duck stamps, may be opened to hunting as long as the waterfowl resource is not being endangered.

As winter closes in on the Klamath Basin and its lakes become frozen, the last hordes of waterfowl move south, principally to the Sacramento and San Joaquin Valleys of California, which have open water the entire year. Located



here are a number of refuges which are probably the most important in the Pacific flyway at the present time, for several reasons. They lie in the heart of the crowded Pacific flyway wintering area. This wintering area is intensively developed agriculturally, with many large cities and towns present. The limited acreage in refuge and waterfowl management areas in the Sacramento and San Joaquin Valleys thus has to hold several million ducks and geese. Farmers do not want these droves of birds on their land before crops are harvested. During the hunting season, which in the case of some crops, such as rice, occurs after the harvest, refuges often provide the only places where these birds can rest unmolested. Rice is a major crop of this area, and since the quantities of ducks and geese present here could destroy a field of rice in a matter of days, preventive measures must be taken.

Farmers can effectively herd waterfowl from rice-fields only when the birds may retreat to a place that provides food. The refuges furnish the answer. Around 2000 acres of rice are planted for waterfowl each year on the Sacramento, Colusa and Sutter National Wildlife Refuges. Larger acreages of lower-cost foods are produced on these and other refuges. These include barley, wild millet (*Echinochloa crusgalli*), as well as many others.

An increasingly important area in the northern San Joaquin Valley is the Merced National Wildlife Refuge. This area is a centre point for the Ross's Goose during the winter months, when this species confines its feeding activities largely to green grass.

In the Imperial Valley near the Mexico-California line is the Salton Sea National Wildlife Refuge. Here barley and other crops planted on the refuge help keep Wigeon and geese from the Valley's lettuce, alfalfa and other crops.

Hunters generally agree that refuges serve as a reservoir for the objects of their sport, and without them waterfowling would be gone in many areas such as the Sacramento Valley.

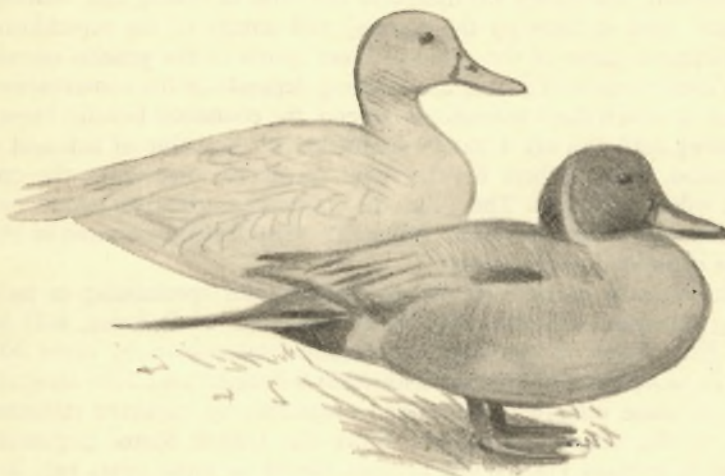
Refuges in other states of the flyway play important roles, too. They help to hold waterfowl away from the problem areas of California, provide shootable populations for the areas they serve, and produce many birds as well. Most of the waterfowl foods in these areas are from natural food plants rather than cultivated ones. The Bear River Bird Refuge in Utah and the Stillwater National Wildlife Refuge in Nevada are examples of fine natural marshes which are stopover points in migration as well as breeding areas for both waterfowl and many species of marsh and shorebirds.

## RESEARCH

Waterfowl research has taken on many phases in the United States. Food habits studies have pointed the way towards better refuge management. Disease studies are helping point the way towards the curbing of such diseases as avian botulism. Caused by the bacterium *Clostridium botulinum*, this disease has killed ducks and geese by the tens of thousands in the interior portions of the Pacific flyway.

Investigations are constantly being carried out to determine the effects on waterfowl of habitat losses through proposed dams, reclamation projects and other alterations of present features by man. A recent evaluation of the wetlands of the United States has helped to focus attention on the serious problem of rapidly disappearing marsh and aquatic habitat. This critical situation has received much public interest and concern and, as a result, a greatly accelerated

land acquisition, research and management programme by state and Federal conservation agencies is now getting under way. This programme includes the setting aside and management of representative habitat at strategic points in each of the four waterfowl flyways, and should help to assure the perpetuation of North America waterfowl and other wildlife for the enjoyment of all who are interested in the out of doors.



Pintail

## WILDFOWLING IN THE U.S.A. AND BRITAIN

**The Importance of Wildfowling in the United States and Britain**  
*A Review of National Survey of Fishing and Hunting, 1955*

by **Hugh Boyd**

IN the early months of 1956 a 'survey of hunting and fishing' was made for the U.S. Fish and Wildlife Service 'to determine the importance of these truly American sports in our (i.e. the American) national economy'. The results of this survey were published a few months later. Circular 44 of the Fish and Wildlife Service (for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.; price 40 cents) is unlikely to be seen by many Trust members, though its contents are of great interest for comparison with what is known or may be guessed about the role of wildfowling in Britain. This review attempts to summarise those parts of the American survey relating to 'waterfowl hunters and hunting' and adds a very few facts and some more speculative estimates about the British situation.