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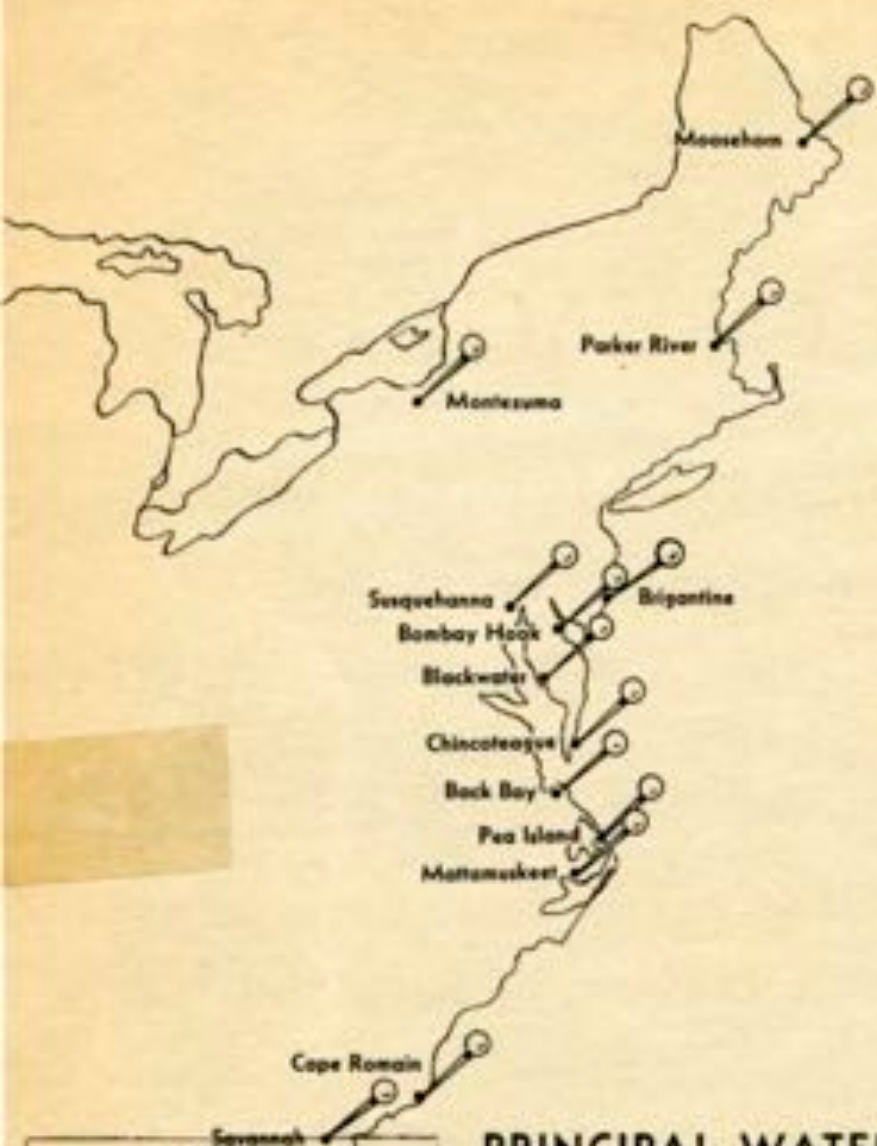
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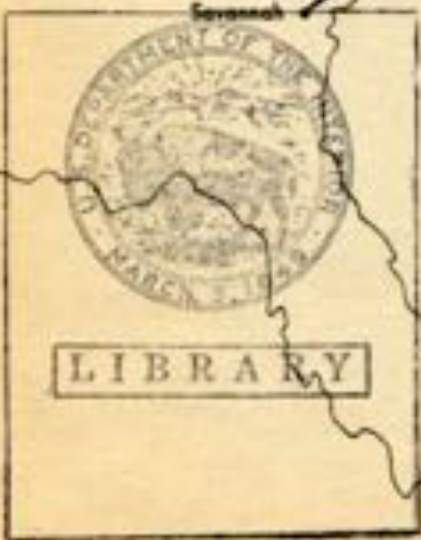
CHINCOTEAGUE a National Wildlife Refuge

Number ONE
Fish and Wildlife

Service, United States Department of the Interior, Washington, D. C.



PRINCIPAL WATERFOWL REFUGES OF THE ATLANTIC FLYWAY



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CHINCOTEAGUE

A NATIONAL WILDLIFE REFUGE

By Rachel L. Carson

Illustrations by Shirley A. Briggs and Katherine L. Howe



Conservation in Action

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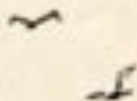
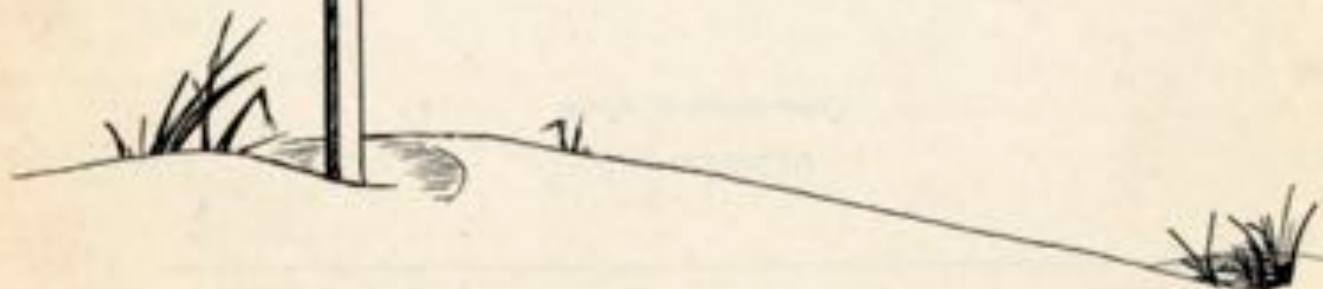


IF YOU TRAVEL MUCH in the wilder sections of our country, sooner or later you are likely to meet the sign of the flying goose—the emblem of the National Wildlife Refuges.

You may meet it by the side of a road crossing miles of flat prairie in the Middle West, or in the hot deserts of the Southwest. You may meet it by some mountain lake, or as you push your boat through the winding salty creeks of a coastal marsh.

Wherever you meet this sign, respect it. It means that the land behind the sign has been dedicated by the American people to preserving, for themselves and their children, as much of our native wildlife as can be retained along with our modern civilization.

Wild creatures, like men, must have a place to live. As civilization creates cities, builds highways, and drains marshes, it takes away, little by little, the land that is suitable for wildlife. And as their space for living dwindles, the wildlife populations themselves decline. Refuges resist this trend by saving some areas from encroachment, and by preserving in them, or restoring where necessary, the conditions that wild things need in order to live.



Chincoteague

A NATIONAL WILDLIFE REFUGE

THE NATIONAL WILDLIFE REFUGE at Chincoteague, Virginia, is one of the newest in a chain of sanctuaries placed along the flight lanes of the waterfowl. Coming down from the north the principal links of the chain are Parker River, Montezuma, Susquehanna, Brigantine, and Bombay Hook. Then from Chincoteague the links run south, through Back Bay and Pea Island, Mattamuskeet and Cape Romain.

Chincoteague, like other waterfowl refuges, is needed because birds migrate, and because in so doing they expose themselves to great dangers. The migration of birds is one of the ancient spectacles of earth, and one of the most mysterious. But while we know little about why birds migrate or how they find their way over enormous distances, common sense tells us this: like human travelers, birds must have places where they can stop in safety for food and rest.

Once there were plenty of natural hostelries for the migrants. That was before our expanding civilization had drained the marshes, polluted the waters, substituted resort towns for wilderness. That was in the days when hunters were few. In those days our waterfowl probably numbered 200 million. Now only a small remnant of this number is left.

If we are to preserve the remaining waterfowl, and the sports and recreations which depend on them, we must set apart for the birds refuges like Chincoteague, where they may find these simple and necessary creature requirements: food, rest, security.

Chincoteague was selected as a refuge site because the biologists of the Fish and Wildlife Service, after years of searching for the best spot to fill the gap between the refuges at Bombay Hook and Back Bay, decided that this wild sea-coast island on the Eastern Shore of Virginia would provide protection and breeding territory for the greatest number of species. Purchase of this site for a refuge was approved by the Migratory Bird Commission in 1942; and the refuge was formally placed under administration by the Fish and Wildlife Service in 1945.

Two things determined the location of the Chincoteague Refuge: its physical features, combining beaches, dunes, marshes, woodland, and protected waters; and its position with relation to the flight lanes of the birds. As to the first:

About nine thousand acres in area, the refuge occupies the southern third of Assateague Island, separated from Chincoteague Island by a narrow channel. Assateague is one of the barrier islands typical of the Middle Atlantic coast,

never more than three miles from shore to shore, lying between Chincoteague Bay and the sea. Seen from the air, as the migrating waterfowl coming in from the north must see it, its eastern border is a wide ribbon of sand that curves around in a long arc at the southern end of the island to form a nearly enclosed harbor.

Back from the beach the sand mounts into low dunes, and the hills of sand are little by little bound and restrained by the beach grasses and the low, succulent, sand-loving dune plants. As the vegetation increases, the dunes fall away into salt marshes, bordering the bay. Like islands standing out of the low marsh areas are the patches of firmer, higher ground, forested with pine and oak and carpeted with thickets of myrtle, bayberry, sumac, rose, and catbriar. Scattered through the marshes are ponds and potholes filled with wigongrass and bordered with bulrushes and other good food for ducks and geese. This is waterfowl country. This is the kind of country the ducks knew in the old days, before the white man's civilization disturbed the face of the land. This is the kind of country that is rapidly disappearing except where it is preserved in wildlife sanctuaries.

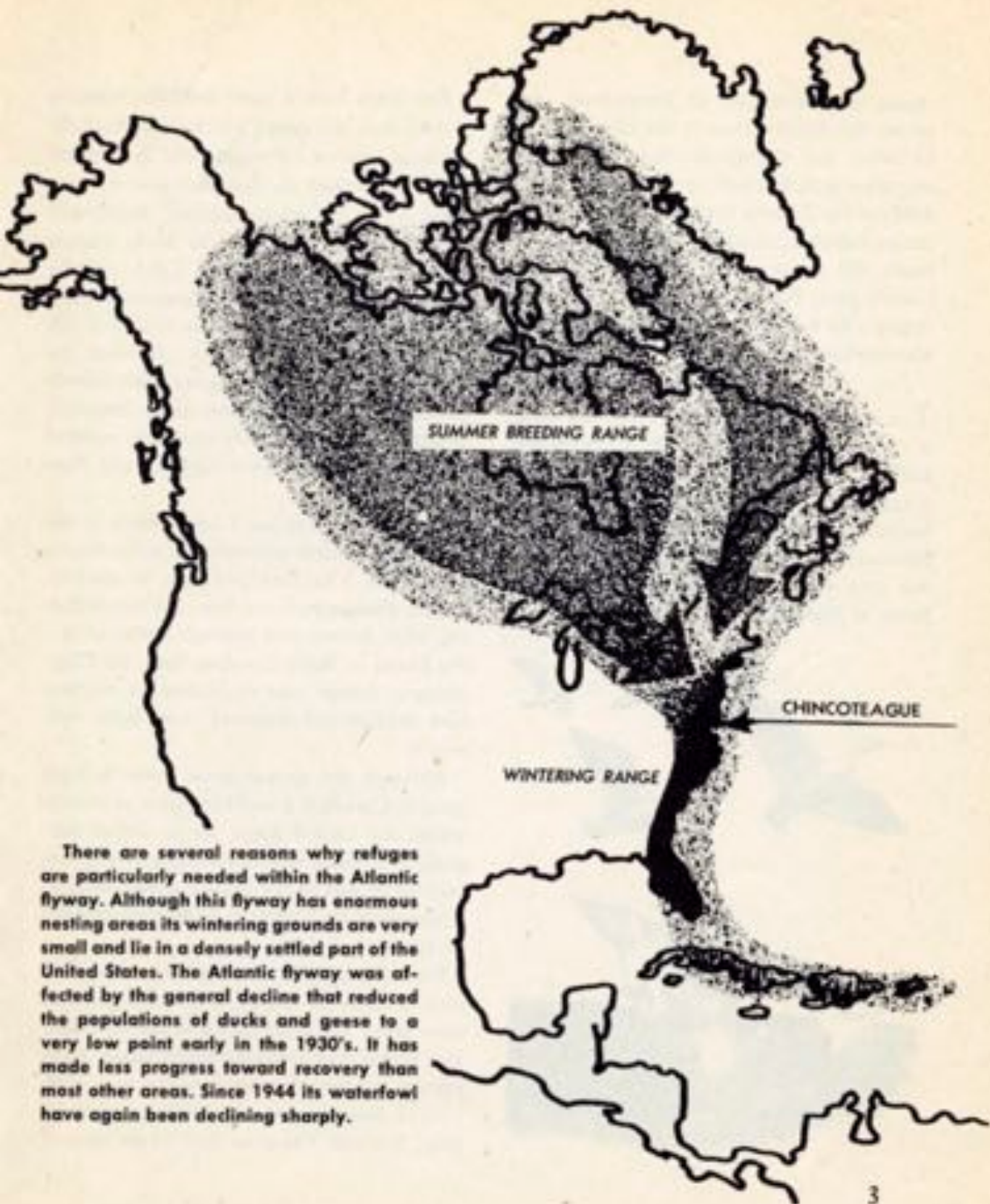
THE PATTERN OF THE FLYWAYS, more than any other fact, determines the location of the waterfowl refuges. A flyway is more than a migration route—it is a whole geographic region. There are four such flyways in the United States: the Atlantic, the Mississippi, the Central, and the Pacific. Although the breeding grounds of the various flyways overlap, each has its own wintering grounds, and a complex system of migration paths leading from winter to summer areas.

It is a peculiar fact of bird biology that waterfowl have a hereditary attachment for one particular flyway, and with rare exceptions never transfer from one to another. This means that each flyway must provide everything the birds need—suitable breeding areas, ample wintering grounds, and safe migration routes connecting them.

THE CHINCOTEAGUE REFUGE is an important way station on the Atlantic flyway. It is located at a strategic point, an area where several of the most heavily traveled lanes of waterfowl traffic converge.

One of these routes begins at the very top of the world—the summer home of the greater snow goose and the Atlantic brant in northern Greenland and the islands of the Arctic Sea. As the snow geese and brant come down by this route across northeastern Canada, they are joined by Canada geese and black ducks and other waterfowl from the shores of Hudson Bay and the Maritime Provinces of Canada. Some of these birds come down the coast. Others come via Lake Champlain and the Hudson Valley, still others via the Finger Lakes of New York to the mouth of the Susquehanna and so to the Chesapeake.

In the latitude of the Delaware and Chesapeake Bays, the Atlantic coast route receives an important tributary from the west. This tributary route is like a river that has many different headwaters scattered over a vast territory, for it has its beginnings in the Prairie Provinces of Canada, the Mackenzie Delta, eastern Alaska, Ontario, and the States bordering the Great Lakes. From the Great Lakes region, the route



There are several reasons why refuges are particularly needed within the Atlantic flyway. Although this flyway has enormous nesting areas its wintering grounds are very small and lie in a densely settled part of the United States. The Atlantic flyway was affected by the general decline that reduced the populations of ducks and geese to a very low point early in the 1930's. It has made less progress toward recovery than most other areas. Since 1944 its waterfowl have again been declining sharply.

crosses the mountains of Pennsylvania and strikes the Atlantic coast in the vicinity of the Delaware and Chesapeake Bays. This is the migration path followed by the majority of the ducks of the Atlantic flyway. Among them are scaups, redheads, pintails, baldpates, teal, canvasbacks, old squaws, some black ducks, some Canada geese. For many of these birds, Chincoteague is the first refuge encountered on the long transcontinental journey.

THE CONSERVATION OF THE GREATER SNOW GOOSE is one of the purposes of the Chincoteague Refuge. Estimates vary, but probably there are not more than twenty or thirty thousand of these beautiful white geese in the world. This entire population spends the winter months on a narrow strip of the Atlantic seacoast from New Jersey to North Carolina.



Few birds have a more northern breeding ground than this goose, which nests along the northern coast of Greenland and in Ellsmere Land, far beyond the boundaries of the continent. From this remote territory, visited only occasionally by explorers, the birds migrate south, probably across Baffin Land and the Province of Quebec, to the St. Lawrence Valley. The birds habitually stop in the vicinity of San Joachim on the St. Lawrence. Between this point and Fortescue, New Jersey, their known landfalls are few. With increasing frequency of late years, however, they have been reported during migration in New England and New York.

Chincoteague Bay has a long history as one of the major winter concentration points for the snow goose. It has been used more consistently, and for a longer period of time each winter than any other known area between Fortescue and Pea Island in North Carolina. Since the Chincoteague Refuge was established its marshes have held several thousand snow geese each winter.

Although the greater snow goose is legal game in Canada, it is under complete protection within the United States. As an added safeguard, the related species, the lesser snow goose, may not be shot on the Atlantic coast because it is impossible for hunters to distinguish between the species in flight.

Protection against shooting is not enough in itself to insure the welfare of the populations of snow geese. The birds must also find abundant food within their restricted winter range. Their pastures are the salt meadows—the acres upon acres of tough rooted salt marsh hay or cordgrass, *Spartina*. The geese feed on the roots of

these grasses. Once there was an abundance of marsh land along the coast, but much of it has been lost by draining and filling. Unless some natural marsh areas are set apart for the use of wildlife, species like the snow goose cannot survive.

Except for the whistling swan, the snow goose is the largest white bird that will be seen on the refuge. The black wing tips show clearly in flight, contrasting sharply with the snowy white of body and wing. Look for snow geese in season in the Ragged Point marshes, where they are likely to be feeding, pulling out the marsh grass by its roots. At times they may be seen flying over the bay or ocean, often in a triangular formation, close to the surface of the water.

THE AMERICAN BRANT, a small goose seldom found far from the sea, is particularly in need of the protection given by waterfowl refuges. Like the snow goose, it breeds in far northern regions and winters on a small section of the Atlantic coast from New Jersey to North Carolina. It migrates chiefly over water, and its distribution within the United States is confined almost entirely to a narrow belt along the coast.

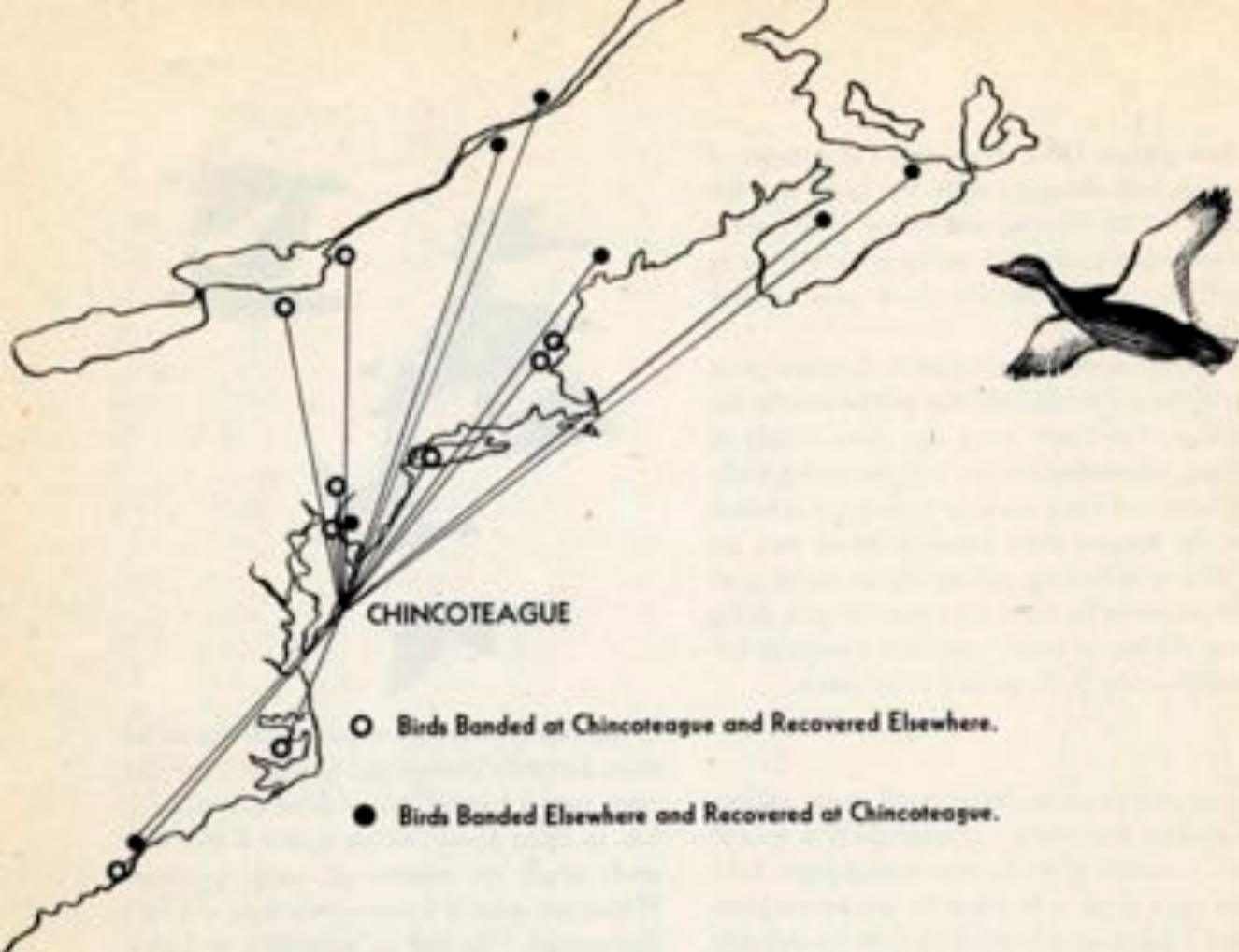
Brant on their fall migration arrive at Chincoteague about November, remaining until the latter part of March. As a rule, between 2,500 and 3,000 winter on the refuge. The Brigantine and Pea Island Refuges also have wintering flocks.

Heavy shooting and draining of marshes are ancient enemies of waterfowl, but a few years ago the brant was faced with a new menace—the complete destruction of its winter forage. Eelgrass has always been the chief winter food



of the brant. Heavy growths of the ribbonlike plant formerly covered the tide flats in almost every coastal bay and sound from North Carolina to Nova Scotia. About 1930 a blight suddenly struck the eelgrass all along the coast. Within the space of a year or two most of it had disappeared. This had an immediate and very nearly disastrous effect on the brant. Without their usual food to help them withstand the rigors of winter, the populations of these small geese very rapidly declined.

Reports of ornithologists all along the coast indicated that the status of the brant had become alarming. Counts by Charles Urner illustrate the decline: from 28,800 brant estimated by Urner as the 1927-28 winter population of brant on the New Jersey coast, the birds declined to 5,400 in 1931-32 and to 2,320 in 1932-33. To give protection to the remaining birds, the Federal Government declared a closed season on brant in the Atlantic Coast States in 1933. During recent years the January inventory of waterfowl, taken



annually by the Fish and Wildlife Service in cooperation with State conservation agencies, has indicated an encouraging increase in the populations of brant as the birds have turned to new food and as the eelgrass, here and there, has made a slow recovery. The brant was returned to the list of game birds in 1944.

Assateague Anchorage is a good place to look for the brant that winter on the refuge. The brant is smaller and shorter necked than the Canada goose; resting on the water it appears mostly dark, although showing the white under tail coverts. Unlike most geese, it habitually gets its food by "tipping" in the shallow water. In flight, brant move swiftly in long, undulating

lines, seldom in the V formation of the Canada goose.

THE BLACK DUCK, the most important of all waterfowl to the eastern gunner, is the predominant species at Chincoteague. It is present in the refuge area throughout the year. From a small breeding population in the summer it builds up to a peak of nine or ten thousand birds by mid-winter. During the spring months, with the influx of transients, the refuge is host to about 12,000 black ducks.

The black duck nests chiefly in the northern and eastern sections of the continent—in Ontario, Quebec, Nova Scotia, New Brunswick,

Labrador, and Newfoundland, also in northeastern United States. Apparently the black ducks that winter at Chincoteague or migrate through this area use three principal routes in traveling from the northern breeding grounds to their winter quarters. These routes have been revealed by the actual recoveries of banded birds, and the comparison of the place of banding with the place of recovery.

One of the migration paths comes down from the vicinity of Lake Ontario across eastern Pennsylvania to the head of the Chesapeake and Delaware Bays. Another comes from the valley of the St. Lawrence down Lake Champlain to Long Island and thence down the coast. The third and apparently the most traveled route comes down the Atlantic coast from eastern Canada and New England. (See map.) Returns from south of Chincoteague have come from North and South Carolina.

These facts seem to mean that the majority of the black ducks that use the Chincoteague Refuge have been produced in eastern Canada and probably Maine, and that they travel through most of the Atlantic Coastal States to reach their wintering grounds. This is a graphic illustration of the fact that waterfowl conservation is a cooperative problem, and that a waterfowl refuge benefits not only the State in which it is located but many other States as well.

Hardy, wary, always adaptable, the black duck has held its own rather better than most other species. When drought ruined the breeding grounds of central Canada, most of the prairie-nesting ducks found themselves in serious trouble; the black, which nests over a vast territory east of the prairie country, was little affected.

On the other hand, the black duck, like many other waterfowl, has felt keenly the loss of the eelgrass. It is true that the eelgrass itself did not form an important part of the black duck's diet. But the many small sea animals—mussels, crustacea, worms, and the like—that lived on and among these plants were welcome variations in the predominant vegetable diet of the black duck. These were, of course, lost along with the eelgrass.

Fortunately, Chincoteague provides other foods for the ducks. Wigeongrass, which fills every pond and water hole on the refuge in the fall, is one of the best duck foods.

The Chincoteague Refuge also provides good nesting cover, with a minimum of interference from man and predatory animals. Although near the southern limit of the breeding range, the refuge adds more than a hundred young black ducks to the population each year.

OF OTHER WATERFOWL AT CHINCOTEAGUE, the pintail and the baldpate (locally called wigeon) are among the most abundant. During an average spring season, for example, about 9,000 pintails use the refuge and about half as many baldpates. Other ducks that may be seen on the refuge marshes or feeding in its ponds are the greater and lesser scaup, green-winged teal, blue-winged teal, mallard, shoveler, gadwall, hooded merganser, ringneck, ruddy duck, and wood duck. Offshore there are thousands of scoters each winter. Smaller numbers of oldsquaws, buffleheads, American goldeneyes, and red-breasted mergansers appear regularly in the waters near the refuge.

Because Chincoteague is on one of the principal goose flight lanes of the Atlantic coast, large





The Chincoteague Wildlife Refuge occupies the lower third of Assateague Island, lying south of the Virginia line except for two small areas in Maryland. Shore birds travel the wide beach and rafts of scoters lie beyond the surf lines in winter. The Ragged Point marshes near the northern end attract many geese and ducks; other marshes south of the lighthouse—known as the Levels—are good waterfowl land also. Sea ducks, like old squaw and goldeneye, the loons, and the cormorants, congregate in Assateague Anchorage and the Inlet. A variety of birds, also deer, foxes, and raccoons find good living conditions in the scattered patches of woodland. Fishermen cultivate their oysters and clams on the leased tide flats of the refuge and in the anchorage. Surf casters enjoy their sport from the seven-mile beach of the refuge.



concentrations of Canada geese occur here during the spring and fall migrations. A thousand or more remain over winter.

Besides waterfowl, most of the common eastern birds have been reported from the Chincoteague area, and the field ornithologist can always count on running up an interesting list. Some 240 species have been identified on the refuge or in its immediate vicinity.

SHORE BIRDS as a group travel farther in their annual migrations, see more sunlight and less darkness than almost any other birds. Some of them nest near the northernmost limits of land; some winter in the most southern parts of South America. In the course of their annual flight between summer and winter homes, they visit our

coasts, their migrations in general following the shore lines.

During the 1800's and early 1900's the shore birds were all but destroyed by heavy shooting. They were a favorite target of the sportsmen of that generation; they were also the quarry of market gunners, who shot them for the morsels of food their small bodies yielded. In the 1880's and later, the craze for feathers to adorn women's hats played its part in the slaughter.

Today the shore birds are protected by Federal law. Their habits make them particularly vulnerable: they raise a single brood in a season, lay on an average only four eggs, nest on the ground, and travel in dense flocks over the open seacoast. They could not long withstand the pressure of modern shooting.

While the nesting grounds of most shore birds are in remote areas, as yet little disturbed by modern civilization, this is not true of the wintering grounds. The Hudsonian curlew, several of the plovers, and many others winter in the grassy plains of Brazil, Argentina, and Peru. There agricultural developments have greatly reduced the areas suitable for the birds. Then, too, many of the shore birds are still subjected to heavy shooting in the West Indies and South America. For these reasons, they need all the



help we can give them to maintain their numbers. By providing good feeding grounds along their migration routes, wildlife refuges are important aids in the conservation of the shore birds.

Ornithologists—both amateur and professional—find the Chincoteague Refuge one of the best places in the Middle Atlantic region to enjoy the spectacle of shore bird migration. Between 30 and 40 species have been recorded there during the spring and fall migrations.

Probably the best spot on the refuge to see a great variety of shore birds is along the shores of Assateague Anchorage. Look for curlews—large, rather long-legged brown birds with a distinctive sickle-shaped bill—in the fringes of marsh grass that border the coves, or on the shellfish reefs. The curlews thrust their beaks deep into the holes of the fiddler crabs, or probe the mud of the reefs. Other large shore birds, slightly smaller than the curlews, are willets and yellowlegs (a). These birds feed mostly in muddy places, often on the banks of marsh creeks on the ebb tide. The whistle of the yellow-

legs, high and clear but with a peculiarly soft quality, is one of the characteristic sounds of such places. Crow-sized, black and white birds with long red bills are oyster-catchers (b).

The smaller shore birds gather in enormous flocks on the mud flats to feed and rest. A single flock often contains a mixture of many species—the sparrow-sized "peeps" or least (c) and semi-palmated sandpipers (d), the larger red-backed sandpiper (e) with its distinctive black belly, and sometimes the rarer Baird's, white-rumped (f), western, and buff-breasted sandpipers. Sometimes a highly colored bird stands out among the others—a turnstone (g), unmistakable in its clean, sharp pattern of black, white, and chestnut.

The large black-bellied plover (h), one of the handsomest of the shore birds, with its pale back and black under parts, is more likely to be seen singly or in small parties of its own kind. Even when all the shore birds within sight start up in alarm, wheeling over the flats in one of their indescribably intricate mass flights, the black bellies tend to keep to themselves.



On the ocean beaches look for the semipalmated or ringneck plover (i), the sanderling (k), and the semipalmated sandpiper. These birds feed at the very edge of the surf, snatching up the small crustaceans washed out of the sand, always seeming about to be overwhelmed by a breaking wave, but always somehow escaping.

THE CHANGING SEASONS AT CHINOCOTRAGUE are reflected in the changing populations of the birds. The summer months are quiet. Except for a few black ducks and a handful of blue-winged teal, the thousands of waterfowl that wintered on the refuge have gone north. They are now dispersed over an immense area, from Greenland to Alaska. The migratory flights of waterfowl from the south have paused briefly at the refuge and now they, too, are gone.

Up in the marshes around Ragged Point the black ducks have been nesting. In April you might have found their nests here and there under the bayberries; in June the broods of ducklings, with their mothers, begin to appear in the slashes. Around the Levels there are a few broods of the blue-winged teal, making its first slow comeback as a nesting bird in this region after years of scarcity. And early almost any morning of the summer you could see a bittern slinking through the tall salt meadow grass or hear the sharp clatter of the rails.

August passes into September, with its briskly cooler nights and shortening days. Since July the shore birds have been returning from the north, and now the beaches and the mud flats are crowded with them. September brings the first of the returning waterfowl, and toward the end of the month flocks of small land bird migrants appear. One morning tree swallows by

the thousand are lined up, wing to wing, on the Coast Guard telephone wires for miles along the beach. Heavy flights of robins and flickers pass through; hawks—mostly the narrow-winged falcons and the accipiters—sweep down the coast toward the south. Then in October, when the marshes are silvered with frost in the mornings, the waterfowl begin to pour in from the north. Crossing the Levels, you see flights of pintails circling the marshes, dropping down into the ponds. After a night of heavy migration, the refuge suddenly takes on new life as flocks of canvasbacks, redheads, teal, and baldpates rise into the air in noisy thousands.

Offshore, beyond the white lines of breakers, great numbers of sea ducks appear. Rafts of scoters parallel the beach from one end of the refuge to the other. Old squaws and goldeneyes congregate in the nearly landlocked harbor of Assateague Anchorage, following the oyster dredgers. These sea ducks flock around the boats so closely they are almost run down, diving for the small sea creatures and plants stirred up by the dredges. Canada geese are increasing day by day, flocking in to the Levels and Toms Cove, a few settling in around the marshes of Ragged Point and Sheep Ridge.

Through October, November, and into December the flights of waterfowl increase. Brant gather in the Anchorage, a few whistling swans appear in the Levels. The snow geese drift in, having made the long flight from Greenland and the islands of the Arctic Sea, with only one or two stops anywhere on the continent of North America.

Some of the waterfowl and all of the shore birds continue south after resting and feeding on the refuge. Other waterfowl remain, some of

almost every Atlantic coast species. At Chincoteague the winters are not, as a rule, severe. The blizzards and the heavy freezes that sometimes lock the Chesapeake in ice from shore to shore are here tempered by the bordering sea, and it is a rare winter when there is not plenty of open water on the refuge where the ducks can get at the wigongrass and the sea lettuce, and plenty of snow-free marsh where the geese can pull up the roots of the salt meadow grasses.

The turn of the year finds about 30,000 ducks wintering on the refuge itself, another 10,000 or so on the bordering ocean and Chincoteague Bay. As for the geese, a fairly mild winter may see nearly 10,000 of them on the refuge—perhaps 5,000 snow geese, several thousand brant, a thousand Canadas. Black duck, baldpate, and pintail are more numerous than any other kinds of fresh-water ducks; scoters and scaups outnumber all other sea ducks.

March is the time of transformation, the

month when the great migrations start. Flock after flock, the ducks, geese, and swans leave for the north. Others come in from the south, linger briefly, move on. By late April, all the waterfowl are gone, except for a few black ducks, teal, and baldpates.

April is the month of the shore birds. Although on an occasional day in March you may hear the high, clear whistle of the yellowlegs, the full tide of the shore bird migration does not reach the refuge until April. The piping, Wilson's, and killdeer plovers, the willet, the spotted sandpiper, and the oyster-catcher stay throughout the summer as nesting birds. There are also little colonies of nesting terns, laughing gulls, and black skimmers on the beach at the southern end of the refuge, known as Fishing Point. But for the most part the activities of the refuge have reached their lowest point by mid-summer—the ebb between the flood tides of migration.





BIRD BANDING, an important activity at many Federal waterfowl refuges, helps trace the intricate pattern of bird migration. In the short time since the Chincoteague Refuge was established, banding done on this refuge has revealed many interesting and useful facts about the birds. These records are supplemented by the results of earlier banding in this area, carried on chiefly by John H. Buckalew, manager of the refuge.

Many different methods, all of them harmless, are used to capture birds for banding. Waterfowl usually are taken in a large, cage-like trap baited with corn. Once captured, the bird is banded by placing a numbered aluminum band around its leg. The band carries an inscription: "Notify Fish and Wildlife Service, Washington, D. C."

So far, most of the birds banded at Chincoteague have been black ducks and pintails. But during the winter of 1945-46, ten different species of ducks, totaling 1,617 individuals, were banded on the refuge.

How migrating waterfowl make use of the chain of refuges along their flyways is clearly illustrated at Chincoteague—first, by recoveries of birds banded there, second, by recoveries at

Chincoteague of birds banded elsewhere. These recoveries so far link Chincoteague with the following Federal waterfowl refuges: Parker River, Mass.; Bombay Hook, Del.; Mattamuskeet, N. C.; and Cape Romain, S. C.

Banding of black ducks has showed us how the migrating birds come down from Canada and New England (page 8); it has also given interesting information about the way the ducks move about during the winter. Apparently they roam about over an area with a radius of a hundred miles or more. For instance, two black ducks banded at Chincoteague in December 1945 were recovered the following month, one in Salem County, N. J., more than 100 miles away, the other at Chesapeake City, Md., a distance of 115 miles.

As for the pintails, banding shows that the migrants that stop over at Chincoteague may continue all the way down the Atlantic coast. Pintails banded at the refuge have been recovered from North and South Carolina and Florida.

The most distant recoveries so far of any Chincoteague-banded birds are these: a common tern recovered in Puerto Rico, and a black duck at Tracadie, Nova Scotia.

AS MANAGEMENT OF ITS MARSH LANDS INCREASES the production of waterfowl foods, creates more potholes and other water areas for the dabbling ducks, and improves nesting areas, Chincoteague will become increasingly useful as a refuge. About 10 years are needed before the results of management can be fairly evaluated. To see what can be accomplished by management, then, it is necessary to turn to refuges older than Chincoteague.

Bombay Hook Refuge, Chincoteague's nearest neighbor to the north, was established in 1937. An initial step in developing the refuge has been the creation of a fresh-water area, 190 acres in extent, known as Raymond's Pool. Already this area, which represents only a part of the proposed fresh-water impoundments, has proved its worth. It is filled with a luxuriant growth of sago pondweed and other fresh-water duck foods and has become an important concentration point for nesting waterfowl.

Management of the Bombay Hook marshes has increased the use of the area by ducks and geese more than 400 percent over a 10-year period. Records show that approximately 30,000 waterfowl were using this area during the fall months in 1936, just before the refuge was established. By the fall of 1942, this figure had been doubled. By the fall of 1945, more than 137,000 waterfowl were stopping for food at the Bombay Hook Refuge before continuing their journey south or settling down to winter in the area.

Then, too, the development of the Bombay Hook marshes has so improved the area as a nesting ground that the refuge annually adds thousands of young ducks to the waterfowl population. When the refuge was established, only nine pairs of nesting black ducks could be found. By 1941, natural breeding of black ducks in the refuge area had so increased that 6,000 young

were produced. Two unexpected patrons of the refuge as nesters are the shoveler and gadwall, western ducks that have found suitable nesting conditions within the Bombay Hook Refuge and now regularly produce broods of young there.

ECONOMIC USES OF THE LAND included within the Chincoteague Wildlife Refuge continue as before the establishment of the refuge.

THE FAMOUS SHELLFISH COUNTRY of the Eastern Shore of the Chesapeake surrounds the Chincoteague Wildlife Refuge. Chincoteague oysters have a widespread reputation for quality; perhaps the fact that they grow in water that is almost as salty as the open ocean accounts for their distinctive flavor. Although the region is best known for its oysters, clamming, carried on throughout the year, probably brings a larger income to local fishermen than the oysters do.

The establishment of a wildlife refuge has not interfered with the use of the area for shellfishing. The refuge itself contains about 290 acres of shellfish grounds. These consist of a narrow strip of flats between the tide lines, running in a long arc around the inside of Assateague Anchorage, and bordering the channel between the islands.





About 184 acres of these grounds are under cultivation. Before the refuge was established, the shellfish area was leased from the former owner of the property. It is now leased from the United States Government. One-fourth of the rental is paid to Accomac County, in which the refuge lies. The balance goes into the United States treasury.

CULTIVATION OF OYSTERS as it is practiced in the Chincoteague area consists of bringing in small, "seed" oysters, planting them on leased grounds, protecting them from natural enemies, harvesting the oysters when they have reached good market size. Fishermen go "down the bay" to dredge the seed oysters from public oyster rocks, then bring back barge loads of the baby oysters and sell them to growers in the Chincoteague area. After getting the best price they can for their load, the fishermen then plant the oysters

for the purchaser, on whatever part of his grounds he directs. These planting operations begin in the spring, continue all summer and into the fall. Fishermen spend many days—sometimes several weeks—dredging a saleable quantity of oysters. During the spring and fall they run the risk that a sudden freeze may kill their barge loads of oysters before they have disposed of them.

CLAMMING is practically a year round occupation in the Chincoteague area. At low tide the clambers work the exposed mud flats in the marshes and scattered through the channels between the islands. The clams lie buried in the mud, in warm weather only a short distance beneath the surface.

Common methods of clamming during the summer are "signing"—watching for the signs of a clam's presence in the mud and quickly digging it out with a short-handled, pronged hoe—and wading. An experienced wader, working in water neck-deep, feels a clam under foot, quickly slides it up his leg, and tosses it into his sack. During the winter clams are taken by tonging.

Cultivation of clams is simple. Clam dealers who lease growing grounds save the smallest sizes—called "buttons"—out of each load they buy. They plant these small clams, allowing them to grow before marketing them. Clam culture does not require planting of shells and elaborate protection against enemies as oyster culture does; on the whole, therefore, it is less expensive and the returns to the grower are larger.

THE WILD PONIES OF CHINCOTEAGUE have made the name of this small Eastern Shore island familiar to people all over eastern United States. Chincoteague Island itself is no longer inhabited by feral stock; the herds graze on Assateague, Wallops, and a few other uninhabited coastal islands. But on the last week end of July, in the annual wild horse round-up, animals from nearby islands are brought to Chincoteague to be sold, so this island still gives its name to the wild horses of the entire region.

Although historical facts about the origin of the horses are scanty, there is no dearth of legend. Some say they swam ashore from a vessel shipwrecked off this coast long before there were permanent white settlements in the region. Others will have it that pirates, systematically plundering coastwise shipping, used to put their horses ashore to graze on the islands.

From whatever stock the ponies descended, they are a rugged lot. Smaller than an average horse, larger than an average pony, their coats a bit shaggy and long, they bear the stamp of their wild seacoast environment. They live most of their lives within sight or sound of the surf, they crop the sparse marsh grasses, they shelter wherever they can when wild storms sweep up the coast. Once each year, men from Chincoteague Island come ashore, and the annual Chincoteague pony round-up begins. The animals are driven together on the beach; at low tide they are herded across Assateague Channel, swimming through water shoulder high to a man, to Chincoteague Island and into a 20-acre enclosure. There the annual pony sale is held, many of the buyers coming from hundreds of miles. The Chincoteague pony business is now largely in the hands of the town firemen, who

own most of the stock, prepare for and manage the annual pony penning carnival and sale.

The establishment of a wildlife refuge on the southern end of Assateague Island did not interfere with the generations-old custom of grazing stock. Permits to graze 300 head of horses and cattle within the refuge property are now held by residents of Chincoteague. One-fourth of the annual rental for this economic use of the refuge land reverts to the counties in which the refuge lies. The presence of these grazing animals is not detrimental to the waterfowl for which the refuge was established. From the standpoint of the owner of the stock, the refuge has proved a better grazing ground than an uninhabited island. The refuge manager, patrolling the grounds, keeps a watchful eye on the stock and more than once has come to the rescue of a pony mired in the marshes, saving it from drowning on the high tide.

USE OF THE CHINCOTEAGUE REFUGE for recreational purposes may be arranged through the refuge manager, who will give permission to visit the refuge at any time that the proposed use of the property does not conflict with the needs of the birds.

The establishment of the Chincoteague Refuge has preserved, in a wild and unspoiled state, a stretch of typical Atlantic seacoast for the enjoyment of those who find relaxation and refreshment in wilderness areas.

This refuge is one of the best places on the Middle Atlantic coast for observing the seasonal migrations of shore birds, and is also a good vantage point for seeing migrating hawks and small

land bird migrants. For this reason it is visited by many ornithologists.

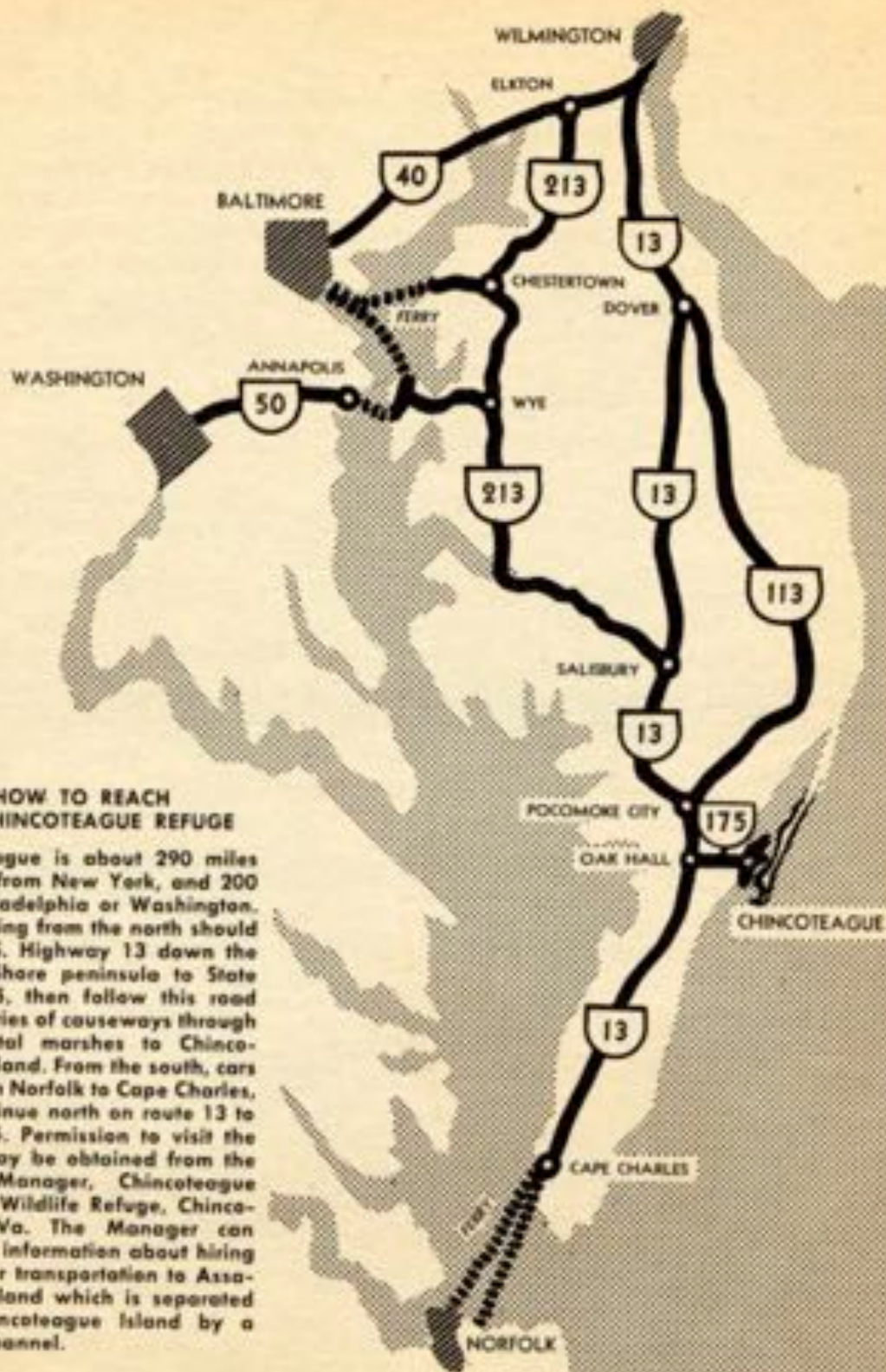
The Chincoteague Refuge provides a demonstration of practical conservation for Boy and Girl Scouts, Sportsmen's Associations, Garden Clubs, Audubon Societies, and other bird and nature study groups.

Various organizations in the Chincoteague area regularly use the refuge for recreation or nature study. Scout troops find its varied terrain suitable for hikes and for practice in acquiring

special camping skills. A group of horsemen from Chincoteague regularly receive permission to ride on the beach.

Assateague Island is a favorite fishing ground for surf casters. Many of them cross the inlet at Ocean City, Md., to the northern end of the island, and work down on the beach; others cross the channel from the town of Chincoteague. During the height of the surf casting season, as many as 50 anglers sometimes use the refuge beaches on a single week end.





HOW TO REACH THE CHINCOTEAGUE REFUGE

Chincoteague is about 290 miles by road from New York, and 200 from Philadelphia or Washington. Cars coming from the north should take U. S. Highway 13 down the Eastern Shore peninsula to State Road 175, then follow this road over a series of causeways through the coastal marshes to Chincoteague Island. From the south, cars cross from Norfolk to Cape Charles, then continue north on route 13 to route 175. Permission to visit the refuge may be obtained from the Refuge Manager, Chincoteague National Wildlife Refuge, Chincoteague, Va. The Manager can also give information about hiring a boat for transportation to Assateague Island which is separated from Chincoteague Island by a narrow channel.