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THE IMPACT OF OIL DEVELOPMENT ON WATERFOWL POPULATIONS IN ALASKA

Donald E. McKnight, Game Biologist, Alaska Department of Fish and Game and Ben L. Hilliker, Deputy Commissioner, Alaska Department of Fish and Game.

INTRODUCTION

The importance of Alaskan waterfowl production and migration areas to Pacific Flyway goose populations has been well documented. According to Hansen (1968), seven subspecies of Canada geese (Branta canadensis) winter in the Pacific Flyway and most of these goose populations breed extensively or exclusively in Alaska. Black brant (Branta nigricans), reared in Alaska and northern Canada, migrate along the west coast of Alaska each fall and congregate on the Izembek Lagoon eel grass beds before dispersing to their wintering grounds. Izembek Lagoon apparently serves as the focal point for the entire black brant population during this period (Hansen and Nelson, 1957), and also hosts a multitude of lesser Canada geese, emperor geese (Philacte canagica), and other waterfowl species. Populations of white-fronted geese (Anser albifrons), which winter in California, breed primarily in the Yukon-Kuskokwim Delta and Bristol Bay areas of Alaska (Dzubin et al, 1964). "White-fronts" nesting in central and northern Alaska and eastward into Canada provide hunting for sportsmen throughout the Great Basin and as far south as Texas and Mexico. Although only a few lesser snow geese (Chen hyperborea) actually nest in Alaska, a nesting colony on Wrangel Island, U.S.S.R., annually sends upwards of 250,000 "snows" through Alaska and down the Pacific Coast to southern California (Cooch, 1964).

Although it is recognized that the Prairie "Pot Hole Country" is the true backbone of production for most important game duck species, Alaskan and Northern Canadian contributions must not be overlooked. Unfortunately, the magnitude of this contribution is presently not well understood. However, James King, Waterfowl Supervisor for the Bureau of Sport Fisheries and Wildlife in Alaska, has provided some insight into Alaska's waterfowl production (King, personal communication). By utilizing data collected annually from 1963 through 1967 during aerial surveys of breeding pairs on Alaska marshlands, and adjusting duck numbers for visibility rates and yearly production, King estimated that the average fall duck population in Alaska during this period approximated 6,537,000 birds. About 5,259,000 of these birds were game ducks; mallards (Anas platyrhynchos), widgeons (Anas americana), teals (Anas sp.), shovelers (Anas clypeata), pintails (Anas acuta), canvasbacks (Aythya valisineria), and scaups (Aythya sp.).

Actually, not all of Alaska's importance to Continental duck populations may be measured in terms of the average fall duck flight. As was pointed out by Hansen and McKnight (1964), drought in the great Canadian pothole region displaces many waterfowl, which would ordinarily nest in this area, further northward to breed. Northern habitats in Alaska and Canada, with their relatively stable water conditions, provide suitable breeding habitat for these drought-displaced birds, and the strength of the fall flights during drought years in much of North America may very well hinge upon these peripheral northern habitats.

Among waterfowl biologists in North America, it has generally been agreed that perhaps the most critical habitat or at least the most seriously threatened waterfowl habitat was the wintering grounds of the respective flyways. With the notable exception of the prairie pothole drainage projects, production areas have been considered relatively secure from man's activities.

However, some hint of changes in the far North was noted in the mid-1960's when the Rampart Dam proposal was such an issue in North American waterfowl circles. Also at that time, oil exploration and geophysical surveys were being conducted throughout the Arctic. Rampart has been layed to rest, at least for the time being, but oil development has gained tremendous momentum. This was capped last year by the Prudhoe Bay discovery and its $900 million bonus lease sale and the equally large, if not potentially larger, discoveries in the MacKenzie River Delta near Atkinson Point and the eastern Arctic Islands of Canada.

The North is changing. The productive and potentially productive geological basins of the Arctic are being explored, drilled and developed. Roads, airports, drillpads, pipelines, and people in some areas are now relatively common. You should be aware of these changes. They are whole Arctic in scope and are not necessarily bad or good. Potentially, from an oil development and pollution standpoint as far as waterfowl are concerned, they could be devastating. At any rate, the solitude of the Arctic is probably a thing of the past, and we as wildlife conservationists, who have long and strongly advocated the principle of multiple use management of our natural resources, are being given the opportunity and the challenge to put our concept to work.

The purpose of this paper is to summarize the present petroleum industry activity in Alaska and attempt to predict future consequences of this activity on northern waterfowl populations.

OIL IN ALASKA

Reference to a map of Alaska showing the State's important waterfowl production and migration regions (Fig. 1) and another map indicating the location of Alaska's known or suspected oil basins (Fig. 2) readily indicates the potential impact on waterfowl presented by oil development within Alaska. Most, if not

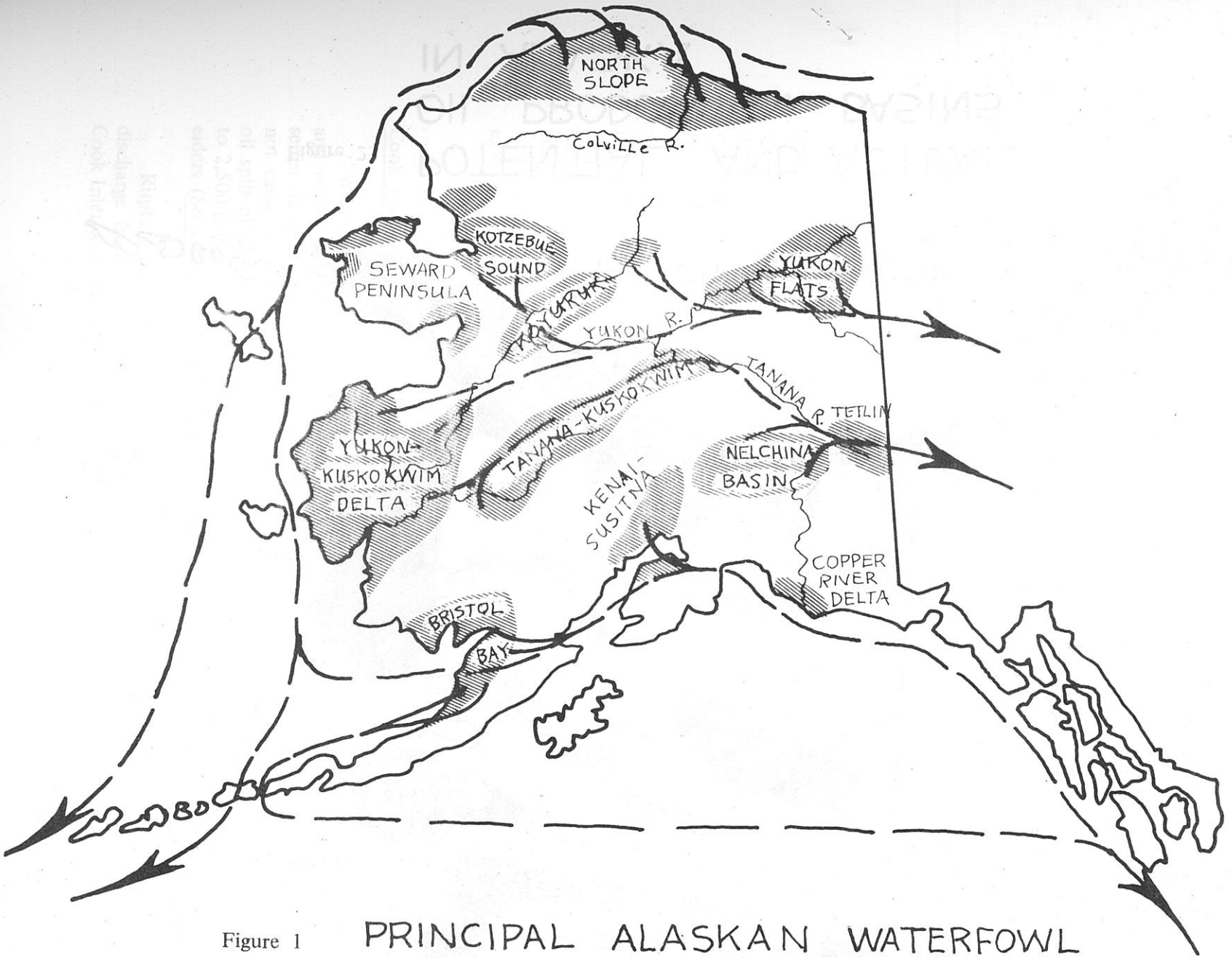

Figure 1 PRINCIPAL ALASKAN WATERFOWL PRODUCTION AREAS AND FALL MIGRATION ROUTES

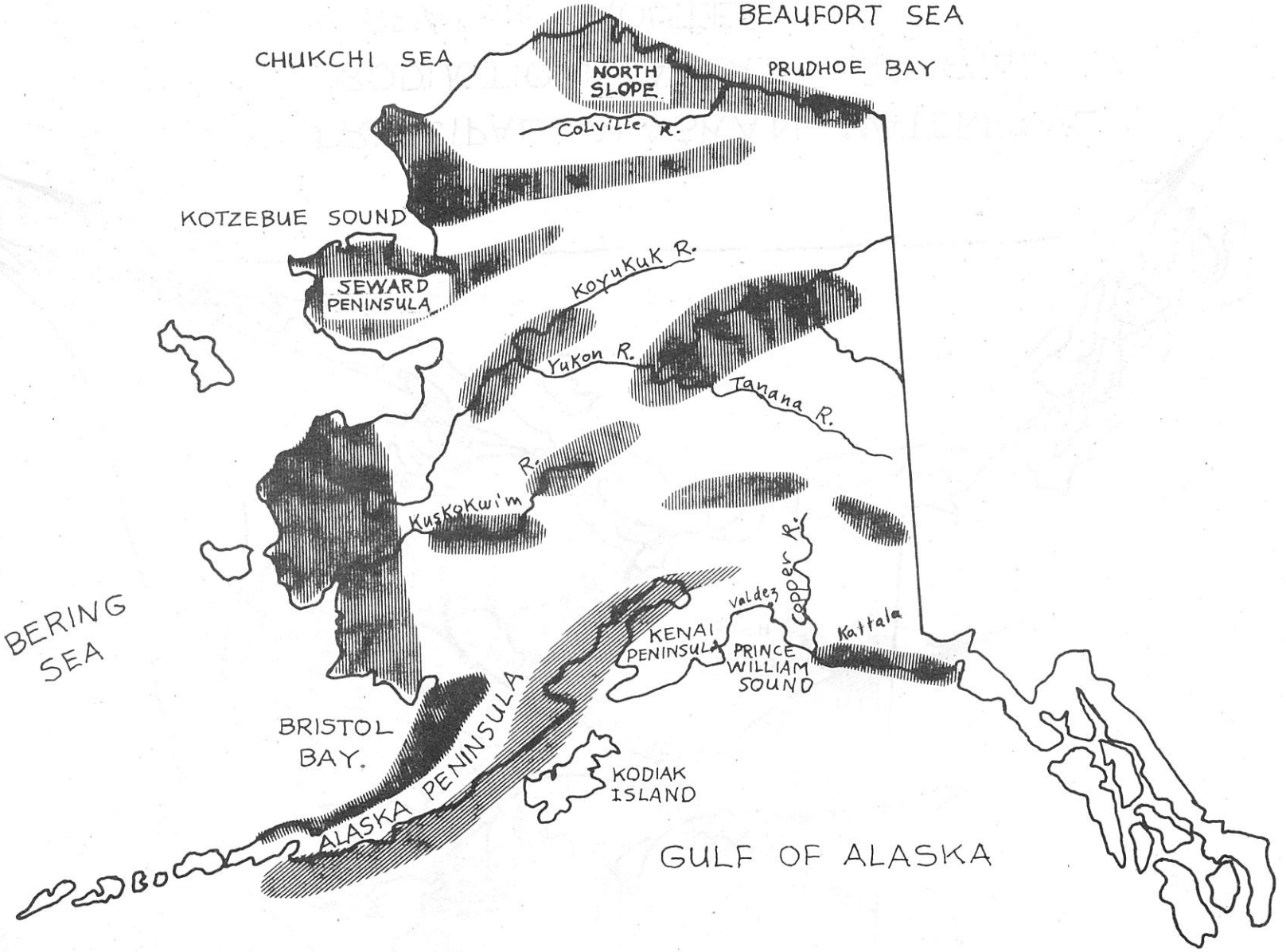

Figure 2. POTENTIAL AND ACTUAL OIL PRODUCTION BASINS IN ALASKA

all, of Alaska's major waterfowl production areas are located in potentially productive petroleum basins. Bristol Bay and the Gulf of Alaska are important waterfowl migration and staging areas, and have both potential for oil production and shipment of oil produced in other regions of the State.

Oil is not a new industry in Alaska. The first successful oil wells were drilled in 1901 near Katalla on the eastern Gulf of Alaska. From 1901 until 1932, when the small refinery burned and the field was abandoned, there were 19 producing wells in the Katalla field. Other exploratory wells drilled in Alaska from 1900 through the mid-1950's were unsuccessful with two major exceptions. The U.S. Navy drilled 37 wells in Naval Petroleum Reserve 4 on the north slope of the Brooks Range between 1943 and 1953; finding the Umiat oil field, and the Gubic and Barrow gas fields. A major oil field was discovered in the Cook Inlet Basin in 1957.

The modern era of oil development in Alaska began with Atlantic Richfield's discovery well on the Kenai Moose Range in July of 1957. Subsequent development of the Swanson River oil field on the Kenai Peninsula resulted in seismic explorations of adjacent areas. These led to the discovery and development of offshore oil fields in Upper Cook Inlet and several extensive gas fields in the Cook Inlet Basin.

Concentrated seismic exploration near Prudhoe Bay on Alaska's North Slope, in 1968 and 1969, resulted in exploratory drilling and the subsequent discovery of petroleum reserves estimated to be among the largest in North America. The famous lease of oil lands in this area for $900 million in September, 1969, and current efforts to exploit this tremendous wealth of the hydrocarbons so important to modern industry, lead us now to an area-by-area appraisal of the potential and existent impact of oil development upon Alaska's waterfowl populations.

PRESENT OIL DEVELOPMENT AREAS OF ALASKA

Cook Inlet

With the development of offshore platforms, subsurface pipeline networks, and expanded marine tanker facilities in Cook Inlet, there began an aggravating series of small oil spills. In most instances petroleum entering these waters did not cause any documented loss of waterfowl. One exception, however, was an oil spill of undetermined origin in November 1967, which caused mortality of up to 2,500 guillemots (Cepphus sp.), white-winged scoters (Melanitta deglandi), Pacific eiders (Somateria molissima), and other waterbirds in the Lower Cook Inlet area.

Rupture of pipelines connecting offshore platforms to onshore facilities, and discharge from platform skim tanks which added emulsified oil to the waters of Cook Inlet were two principle sources of pollution. Changes in operating procedures

by the petroleum industry at Cook Inlet have led to a sharp reduction in the number of incidents of pollution from these two sources. Oil industry activities have apparently not been detrimental to the migrant or resident waterfowl of this area. Future expansion of the petroleum industry to the offshore areas of Lower Cook Inlet also should not pose any potential hazard to these waterfowl populations.

North Slope

Present plans to develop the petroleum reserves on Alaska's North Slope are nebulous. Exploration is continuing, but most efforts are aimed primarily at developing an 800-mile-long pipeline which will transport crude oil from the North Slope to Valdez, an open water port on Prince William Sound.

Past information and results of recent surveys reveal that the North Slope is a region of marginal waterfowl habitat. An aerial survey of the entire 23,000 square miles of North Slope waterfowl habitat conducted in July and August, 1966, indicated that its total summer goose population probably did not exceed 15,000 Canadas (probably B.c. taverneri), 50,000 white-fronts, 1,000 lesser snow geese, and about 35,000 black brant (King, 1967). Brant production was approximately 5,000 birds and most geese seen were molting subadults or adults. King concluded that goose nesting in this area is widely scattered and there seemed little likelihood of conflict with oil development. Many of the molting geese observed, however, were concentrated on a limited area near Cape Halkett, about 100 miles southeast of Point Barrow on the Naval Petroleum Reserve, and King believed that this important region might be vulnerable to future petroleum activities. The latest comprehensive survey of breeding ducks on the North Slope was accomplished in 1957, when a density of 3.1 ducks per square mile [(68% oldsquaws (Clangula hyemalis)] was found (King, 1967).

Bartonek (1969) prepared a comprehensive report of the projected impact of the proposed oil pipeline from Prudhoe Bay to Valdez. He observed that present stipulations governing the construction and operation of the pipeline seem adequate to prevent undue losses of waterfowl and their habitat. Bartonek's primary concern was that a rupture of the pipeline during its operation could endanger several large and important populations of waterfowl. Thousands of eiders, oldsquaws, and black brant migrating through this region could be endangered by a massive oil spill on the North Slope, the Beaufort Sea, or the Sagavanirktok River. The bulk of Alaska's 3,500 trumpeter swans (Olor buccinator) nests in the Gulkana Basin, Minto Flats, and the drainages of the Copper, Tanana, and Koyukuk Rivers. All of these areas could be involved should a break occur in the pipeline. The population of from 20 to 25,000 dusky Canada geese (Branta canadensis occidentalis) which nests on the Copper River Delta would similarly be in danger of potential pollution from a pipeline break on the upper Copper River.

It now appears that petroleum development on the North Slope represents a minimum concern for waterfowl in Alaska. This area is marginal waterfowl habitat at best and, because the oil industry is working in only a limited portion of it, the overall impact should be slight. Construction of the oil pipeline from the North Slope to Valdez also appears to be of minimal importance to Alaskan waterfowl populations. The potential danger from oil leaks and spills once this pipeline is operational is, however, a major concern. Leaks may occur, and if they should occur at a critical time or place the potential exists for a great loss of waterfowl and waterfowl habitat. A spill along the Copper, Koyukuk, or Yukon Rivers in June or July, when downstream production areas contain breeding and molting ducks and geese, could cause severe waterfowl losses.

The greatest potential problem for Alaska's waterfowl from North Slope oil will be associated with the operations of the Trans-Alaska Pipeline System's terminal site at Valdez. Operations of ship loading facilities at this port combined with heavy tanker traffic through Prince William Sound represent a pollution source that could result in significant sea bird and waterfowl mortalities. Oil spills or bilge pumping in the Gulf of Alaska or Prince William Sound are another potential problem for the dusky Canada geese of the Copper River Delta. During fall and spring, migrating ducks, geese, swans, little brown cranes (Grus canadensis), and other waterbirds concentrate in marshlands bordering Prince William Sound and the upper Gulf of Alaska. Offshore spills during these periods could seriously effect these populations of migrating birds.

Gulf of Alaska

Offshore seismic explorations during the 1960's in the Gulf of Alaska indicate that the floor of this body of water overlays extensive potential petroleum reserves. Although drilling operations have not been initiated, it is possible that offshore drilling in the future could result in another major discovery and subsequent oil development. The bays and inlets along the upper Gulf of Alaska, excluding the Copper River Delta, contain little waterfowl nesting habitat but serve as important resting areas for migrating game ducks and geese and wintering areas for a variety of sea ducks. Fall and spring migrations of the entire North American population of black brant pass through the Gulf of Alaska (Hansen and Nelson, 1957), as do Wrangel Island snow geese and cackling geese (Branta canadensis minima) from the Yukon-Kuskokwim Delta.

Although offshore drilling could potentially be a problem in this area, increased oil shipping would be the greatest concern in the Gulf of Alaska. Oil spills and bilge pumping could certainly increase dramatically with stepped up tanker traffic, and the potential for major oil-caused mortality to migrating waterfowl would increase proportionately.

Bristol Bay and the Alaska Peninsula

Onshore and marine seismic activities combined with limited onshore drilling have stimulated increased oil interest in the fish and waterfowl-rich Bristol Bay and Alaska Peninsula areas. Each fall, estuarine habitats along the north side of the Alaska Peninsula host some of the greatest waterfowl concentrations on the North American Continent. The important eel grass beds of Izembek Lagoon support the entire world population of black brant for a few months each year. It is estimated that approximately 100,000 lesser Canada geese, most of the North American population of emperor geese, and upwards of 200,000 game ducks also use the Izembek Lagoon during their fall migrations. The endangered Aleutian Canada goose (Branta canadensis leucopareia) migrates through Izembek Lagoon in the fall, and during mild winters up to 20,000 emperor geese winter there.

To the east, toward Bristol Bay, aerial surveys in October, 1969 revealed concentrations of about 64,000 cackling geese on the Ugashik River Flats, about 75,000 emperor geese on the Cinder River Flats, about 45,000 emperor geese at Port Heiden, and approximately 140,000 game and sea ducks in these areas. Waterfowl and sea birds numbering in the millions use these areas annually and would be susceptible to oil pollution when the petroleum industry expands into this portion of Alaska.

Although the importance of estuarine areas of Bristol Bay for waterfowl has been well documented, few attempts have been made to determine numbers and species of waterbirds utilizing offshore waters throughout the year. Situated at the north rim of the huge Pacific Basin, the fertile, shallow waters of Bristol Bay are a crossroad for migrant birds bound to and from vast Arctic nesting areas in Siberia, Alaska and Canada. In the fall of 1969, the initial attempt was made to survey the offshore zones of Bristol Bay (King and McKnight, 1969). Aerial sampling techniques, originally designed for breeding pair counts, were modified slightly for this survey. The zone from the mean high tide line to the 12-mile limit, encompassing about 8,064 square miles of water area, was sampled in early October. The average number of birds, predominantly American scoters (Oidemia nigra), observed per square mile was 47.83±27.5%. Results of this sample, translated onto the entire area sampled, provided an estimate of 385,702±27.5% waterbirds in this area.

Ocean currents in Bristol Bay flow north and eastward along the Alaska Peninsula. An offshore oil spill of major magnitude near the southern end of the Peninsula or anywhere along its 400-mile shoreline would represent a potential pollution hazard which could seriously effect the majority of North American emperor geese, black brant, and thousands of ducks, geese, and nongame birds. Spills in any of the important lagoons or estuaries on the Peninsula would be potentially serious, since the majority of the birds migrating through western Alaska use these lagoons as resting and feeding areas along their route.

Potentially, at least, oil development on the Peninsula and in Bristol Bay, could seriously effect brant, cackling goose, and duck hunting for a significant portion of Pacific Flyway waterfowl hunters. The potential pollution impact of the oil industry in this critical area for North American waterfowl cannot be overemphasized.

POSSIBLE OIL DEVELOPMENT AREAS OF ALASKA

Yukon Flats

Recent oil drilling activities in the Kandik Basin of northwestern Canada have stimulated renewed petroleum interest in the Yukon and Porcupine River Valleys of Interior Alaska. This extremely important waterfowl production area could also experience significant changes within the next fifty years due to oil industry related activities.

Breeding pair counts indicate that over half a million ducks breed on the 10,500 square-mile Yukon Flats each year (U.S. Department of Interior, 1964). The fall flight from this area is annually estimated to be over 1.5 million ducks. Widgeons are the most common species, with scaup, pintails, green-winged teal (Anas carolinensis), scoters, shovelers, and canvasbacks also represented in good numbers. Several years ago, during Rampart Dam studies, canvasbacks nesting in this area represented almost nine percent of the total Continental breeding population (U.S. Department of Interior, 1964).

In addition, each year over 8,000 lesser Canada geese, 2,000 "white-fronts", and up to 10,000 little brown cranes, also nest on the Yukon Flats.

Active drilling operations with associated roads, airfields, drillpads, and other surface facilities and increased human activities associated therewith represent another potential impact on what has been a relatively undisturbed waterfowl production area.

Yukon-Kuskokwim Delta

The most important waterfowl production area in Alaska is the 26,000 square-mile Yukon-Kuskokwim Delta of northwestern Alaska. This rich, lowland waterfowl area provides nesting habitat for the entire Continental population of cackling geese, emperor geese, and for the majority of North America's black brant. The bulk of Pacific Flyway whistling swans (Olor columbianus) nests here, while "white-fronts", "lesser Canadas" and little brown cranes are also common nesting species.

In an average production year, from 500,000 to 750,000 ducks and 500,000 geese (King, personal communication) nest and raise their young on the "Delta". The Yukon-Kuskokwim Delta, or the Bethel Basin to geologists, encompasses an area with significant petroleum potential. The basin extends farther inland to the south along the Kuskokwim River and, of course, reaches offshore into the relatively shallow Bering Sea. Of special future importance to Pacific Flyway duck populations is the small geological basin lying to the east of the Bethel Basin which includes the Innoko River Valley. The Innoko Valley is well known for its production of Pacific Flyway pintails. At the present time, there is no activity of a petroleum nature in the Yukon-Kuskokwim Delta and Innoko River Valley. However, within the next 10 to 15 years, as other petroleum basins are explored and come under production; exploration, drilling, and perhaps development of the Yukon-Kuskokwim Delta and Innoko River Valley may follow.

SUMMARY

The impact of Alaska's current oil boom on waterfowl populations and wetland habitats is slight at present. Petroleum-related activities, primarily tankers in Cook Inlet, have resulted in occasional oil spills and subsequent bird losses. The consequences of these activities in Cook Inlet are, however, minimal and probably will continue to be of negligible importance to overall waterfowl populations.

Petroleum interests are now centered around massive oil reserves on the north slope of the Brooks Range. This region contains marginal waterfowl habitat except for an important concentration point for molting brant and geese at Cape Halkett, on the Naval Petroleum Reserve. Construction of the pipeline from Prudhoe Bay to Valdez probably will have little adverse effect on waterfowl populations, however, the potential hazard of oil pollution resulting from breaks in this pipeline is great. Such a break adjacent to the Yukon, Tanana, Kuskokwim or Copper Rivers, or at numerous other streams, could result in serious damage to important waterfowl habitat or populations of breeding waterfowl downstream from the break. The magnitude of such losses would depend upon the volume of oil spilled, the time of year, waterfowl numbers and distribution on the area affected, persistence of oil in the polluted area, and many other factors (Bartonek, 1969).

Perhaps the greatest threat to Alaska's waterfowl populations from North Slope oil is associated with the terminus of this pipeline at Valdez on Prince William Sound. Here, increased petroleum shipping, with its potential oil spills, bilge pumping, and tanker mishaps, constitutes a definite hazard to breeding populations of Dusky Canada geese and other waterfowl, and to ducks, geese, and other waterbirds moving through this area during spring and fall migration periods.

Seismic explorations have revealed that the Gulf of Alaska may be underlain with vast petroleum reserves. Offshore drilling and the subsequent shipment of these reserves could add to the current threat of oil pollution posed by shipment of North Slope oil through the port of Valdez.

Should oil exploration on the Alaska Peninsula and in Bristol Bay reveal the existence of oil reserves, and should subsequent oil development prove technically and commercially feasible, a significant segment of North American waterfowl habitat would be involved. A single inopportune oil spill in Bristol Bay would endanger the entire population of black brant, the entire population of emperor geese, the entire population of cackling geese, and important subpopulations of snow geese and lesser Canada geese along with many thousands of other waterfowl and sea birds.

Increasing demands for petroleum products throughout the world will inevitably lead to expanded oil development activities in Alaska. The majority of Alaska's key waterfowl production and migration areas are situated within potential oil bearing geological basins. Drilling, construction, and oil pollution in key waterfowl habitats will undoubtedly have a detrimental effect on Alaska's contribution to Continental waterfowl populations. The magnitude of this impact will depend upon a multitude of variables, but Alaskan oil development will certainly be a major problem facing us in the next 5 to 10 years and for many more years to come.

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