Game Transplants in Alaska

ALASKA DEPARTMENT OF FISH AND GAME

by
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FRONT COVER :

Capture crew removes sea otter from gill net off Amchitka Island. (ADF&G photo by E. G. Klinkhart)

Tranquilized caribou destined for introduction to the Kenai Peninsula is transported by helicopter to a nearby landing strip.

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INTRODUCTION

Durward Allen, prefacing his discussion of the history of animal transplants in the classic book "Our Wildlife Legacy," suggested that: "It is probably human nature to overlook the blessings close to home and to be forever appraising the seemingly greener grass across the fence." Allen was, of course, referring to man's ostensibly inborn dissatisfaction with the wild animals already available to him locally and to his compelling desire for additional species for his use or enjoyment. This seemingly unquenchable drive to obtain additional animals has resulted in numerous introductions or transplants of animal species into previously unoccupied areas; some have been successful, others have been unsuccessful or even ecologically disastrous.

Most Americans are familiar with the great successes obtained by transplanting ring-necked pheasants *(Phasianus colchicus)* from their oriental homelands to North America many years ago. Regardless of the measure utilized, whether it be recreational opportunities provided, pounds of meat consumed or aesthetic considerations enhanced, the importation of this species to the New World must be considered a noteworthy success. Introductions of starlings *(Sturnus vulgaris)* and house sparrows *(Passer domesticus)* into the United States are equally familiar but their results are considered less than beneficial by most. An even more convincing example of an undesirable transplant occurred when the European rabbit *(Oryctolagus cuniculus)* was introduced into Australia. This species spread rapidly across the continent, requiring monumental expenditures of money and effort to control it when through overabundance it became a pest. Still, apparently because of man's inherent optimism, there has been a tendency to remember the few successes and forget the failures and mistakes.

The history of Alaska is replete with a staggering succession of game transplants (Burris, 1965). Early in its exploration and settlement the Russians recognized the potential for introducing and harvesting foxes on the many islands comprising the Aleutian Chain (Elkins and Nelson, 1954). Fox introductions continued into the 1900's, first by Russians and later by residents of the Territory.

The Territorial Government became involved in transplants in 1917 when the Governor of Alaska directed a black-tailed deer *(Odocoileus hemionus sitkensis)* transplant to Prince William Sound (Elkins and Nelson, 1954). This effort was initiated in 1916 by the Cordova Chamber of Commerce.

Transplants in Alaska reached their peak in the 1920's. When the Alaska Game Commission was established in 1925, the impetus for transplants was quickly assumed by the Territorial Legislature (Elkins and Nelson, 1954). That year a transplant program was initiated by that body, with an entire chapter of Territorial law being devoted to animal introductions. Transplant projects were enumerated, and the Alaska Game Commission was required to conduct at least one project in each judicial division every two years. These statutes are reproduced in Appendix I. With statehood, these antiquated laws were incorporated into state statutes.

Unfortunately, this legislative transplant program was based on very little, if any, biological knowledge and scant consideration was given to its feasibility or desirability. Habitat requirements of the species were essentially ignored, and several animals were listed that would serve no useful purpose if they were successfully established. To further complicate the matter, the legislature during the 1930's failed to appropriate funds for the specified transplants.

When the Bureau of Biological Survey was absorbed into the Fish and Wildlife Service on June 30, 1940, the latter took over the game transplant activities of the Alaska Game Commission. These activities were later transferred to the newly formed Bureau of Sport Fisheries and Wildlife.

A fairly comprehensive policy on transplants was submitted to Fish and Wildlife Service employees in a memorandum to all field stations from Clarence J. Rhode, Regional Director, dated December 18, 1950. The memorandum, in part, stated:

> Since its origin, the Alaska Game Commission has received numerous suggestions, requests, and demands for stocking, restocking, and introducing a long list of game animals, game birds and fur bearing animals in various parts of Alaska. Additional proposals are being made each year and the matter will not rest. That many of these proposals have merit can be shown in the success of the work in Alaska with the black-tail deer, elk, bison and hare but the story is not complete without a review of the failures with hare, muskrat, beaver, deer, pheasant, and many others. So far, Alaska has escaped problems such as those of the rabbit in Australia, the muskrat in Holland and the starling in the United States. The Fish and Wildlife Service should take every precaution to avoid questionable recommendations to the Commission on any proposals for stocking, restocking, or introductions.

This action was significant in that it was an attempt to establish a program based on the merits of a transplant rather than the politics of the time.

In 1959, with the dawn of statehood, Alaska's transplant program was inherited by the Alaska Department of Fish and Game. Ultimately the Department established a policy similar to but stronger than that of the Bureau of Sport Fisheries and Wildlife. This policy states:

> The Department recognizes that transplanting game species for restocking former ranges or stocking vacant habitat may be a useful management tool. Because transplants often have unforeseen detrimental effects, importing and transplanting of game will be generally opposed, but may be approved if substantial public benefit can be shown. Proposed transplants will be reviewed by the Department and must meet the following minimum requirements to be approved: 1) The proposed transplant site must provide sufficient and suitable habitat to support a viable population of the transplanted species, as determined by comprehensive study; 2) Prior study must establish that the introduction of a species will not adversely affect the numbers, health, or utilization of resident species.

In 1970, during the second session of the Sixth Alaska Legislature, the statutes (Sec. 16.25.010) dealing with wildlife stocking of public lands were amended to read as follows:

> There is adopted a program of stocking lands in the state with valuable game and fur-bearing animals which do not at present occur on those lands. The department is responsible for establishing priorities on the species of animals to be stocked and the area of the stocking. Priorities shall be based on the habitat requirements of the species, the population of native game animals present, and other factors that will effect the successful establishment of the species.

Transplants conducted by the Alaska Department of Fish and Game are accomplished primarily under the Federal Aid in Wildlife Restoration Act. Prerequisites of the federal government include the justification of all transplants, preparation of an environmental impact statement, and the formulation of cooperative agreements between the agency which controls the land and the Alaska Department of Fish and Game. The Bureau of Land Management, U. S. Forest Service, and the Bureau of Sport Fisheries and Wildlife, Wildlife Refuge Branch, are the federal land management agencies primarily involved with the land on which transplants may be made by the Department of Fish and Game.

Alaska's game transplant program has evolved from one based on hope and fancy to one that considers all aspects of the animal species to be transplanted and the potential impact of that species upon native game populations.

Because few opportunities remain for the successful introduction of game animals into unoccupied ranges in Alaska and because each proposed transplant will be preceded by intensive study to preclude predictably unsuccessful or detrimental introductions, the future transplant program will be limited. Some of the state's excellent game populations have resulted from past transplants, however, and it is the purpose of this report to consolidate all available information on this aspect of Alaska's brief but interesting history.

TRANSPLANT OBJECTIVES

Game transplants, deliberate efforts by man to remove wild animals from one place and introduce them elsewhere, have been attempted with many goals in mind. These range from merely an aesthetic interest to the desire to obtain a harvestable population. In general, however, the objectives of any transplant fit into one or more of the following six broad categories: 1) providing increased recreational hunting opportunities; 2) providing additional food supply; 3) providing economic gain; 4) reestablishing a species; 5) preserving an endangered species; or 6) providing the opportunity to view a species in a new environment. These objectives may best be illustrated by reviewing several transplants that have taken place in Alaska.

Increased Recreational Hunting

This probably was the primary objective of most big game animal transplants attempted in Alaska. Excellent examples would include elk *(Cervus canadensis roosevelti)* transplants to Afognak Island, Kruzof Island and Revillagigedo Island; deer transplants to Prince William Sound, Kodiak Island and other areas; and moose *(Alces alces)* transplants to the Copper River Delta, Berners Bay and the Chickamin River.

Additional Food Supply

It is doubtful that any transplant of a wild species in Alaska has been conducted for the sole purpose of providing food for humans. However, it is difficult to completely separate this category from that of recreational hunting. Certainly if the meat could not be eaten the hunting pressure would be negligible. Also, there are always a certain number of "meat hunters" who hunt only to put meat in the freezer. From this standpoint, the previously mentioned elk, deer and moose introductions could also be classified as transplants of food animals.

Providing Economic Gain

This category primarily involves furbearers. Because of the long history of trapping in Alaska, there has been much interest in transplanting furbearers. Furbearers that have been transplanted to various parts of Alaska include foxes, muskrats *(Ondatra zibethica)*, beavers *(Castor canadensis)*, sea otters *(Enhydra lutris)* and mink *(Mustela vison)*.

Reestablishment of a Species

The recent reintroductions of muskoxen *(Ovibos moschatus)* to the North Slope and Seward Peninsula are prime examples of transplants conducted for the purpose of reestablishing a game species. Another transplant in this category is the reintroduction of sea otters to Southeastern Alaskan waters. These transplants, when feasible, are probably more desirable than any other that the Department of Fish and Game might undertake.

Preservation of Endangered Species

Perhaps at one time the sea otter could have been placed in this category. Today, however, sea otter numbers have increased to a level where the animal, at least in Alaska, cannot be classified as an endangered species. The importation of bison *(Bison bison)* to Alaska in 1928 might also be described as a transplant originally designed to preserve an endangered species.

Opportunity to View a Species in a New Environment

This category may generally be applied to those ill-conceived and poorly planned transplants which could not be justified by any of the objectives mentioned earlier in this report. Fortunately, many of the proposed introductions that would fall into this category have never been implemented. Some suggested transplants that might fall into this category include the introduction of chamois *(Rubicapra rubicapra)* to Southeastern Alaska, polar bears *(Thalarctos maritimus)* to Mendenhall Glacier, and Siberian blue squirrels *(Sciurus vulgaris)* to the Seward Peninsula.

In order to determine if a transplant has been successful, the resulting established population must be compared to the original objectives of the transplant. For example, if the objective was to transplant a game animal to provide food for humans, the population must reach a level high enough to sustain a substantial harvest. The same measure of success would apply to those transplants designed to provide economic gain through trapping. In either case, the underlying basic criterion of success is the establishment of a population capable of sustaining itself over a long period of time.

BIG GAME TRANSPLANTS

Deer

Prince William Sound

In 1916, the Cordova Chamber of Commerce arranged to have black-tailed deer moved from the Sitka area to Hinchinbrook and Hawkins Islands in Prince William Sound (Elkins and Nelson, 1954). This effort resulted in the release of eight deer on these islands. The Territorial Governor's office, using funds provided by the Territorial Legislature, sponsored this project from 1917 through 1923 and an additional 16 deer from the original source were released on the same area during this period.

This was the initial big game transplant in the state, and it has proven to be one of the most successful. The deer survived and spread throughout the islands of Prince William Sound. A small number migrated to the mainland and established other populations. Legal hunting was first permitted in 1935 (Elkins and Nelson, 1954). An average of 1,000 to 1,500 deer are harvested annually in the Prince William Sound area from this deer herd.

Kodiak Island

In 1924, deer transplanting efforts shifted to the Kodiak area when 14 animals were released on Long Island (Elkins and Nelson, 1954). Like the animals for the Prince William Sound release, these deer were obtained from the Sitka area. Two additional deer, from Prince of Wales Island, were released on Long Island in 1930.

The effects of the Long Island transplant were not immediately apparent. In a report to the legislature, dated March 1931, the Alaska Game Commission mentioned that only three does and two bucks had been seen on Kodiak Island.

Because of the apparent failure of deer to move readily from Long Island to Kodiak Island, efforts were renewed in 1934 to establish deer on Kodiak Island (Alaska Game Commission, 1935). Using Federal Emergency Relief funds, deer were captured in the Rocky Pass area near Petersburg. On April 15, five does and four bucks were released on Kodiak Island.

The techniques used for capturing deer in the Rocky Pass area were unusual to say the least. Selected animals were driven from small islands into the water where they were picked up in small boats and then transferred to the larger patrol vessel "Seal." The animals were rubbed dry, placed in wooden crates and held for shipment. Though crude, the technique was fairly effective, with nine animals being shipped to Kodiak and 12 to Yakutat Bay.

The transplants to Long Island and Kodiak Island must be classified as unqualified successes. Legal hunting was initiated in 1953 and 38 bucks were taken (Elkins and Nelson, 1954). The harvest in 1967 was 1,500 deer and the average annual kill is in the neighborhood of 950 animals. By the late 1960's deer from Kodiak Island had successfully established themselves on adjacent Afognak Island.

Yakutat Bay

As mentioned previously, some of the animals captured at Rocky Pass were shipped to

Yakutat Bay. On March 27, 1934, seven does and five bucks were released on several small islands in the Bay (Alaska Game Commission, 1935).

This transplant was successful from the standpoint of establishing deer populations. However, a relatively small proportion of the existing animals are harvested. Deer are taken in the Yakutat area primarily by hunters pursuing other animals, such as moose and bears.

Other Areas

At first glance, it might appear that deer transplants are almost guaranteed to provide huntable populations. This is not the case, however, and there are records of deer releases in Alaska that have done nothing to increase hunting opportunities. For instance, in 1923 seven deer from the Sitka area were released on the Homer Spit on the Kenai Peninsula (Elkins and Nelson, 1954). These animals soon disappeared from this area and the plant was considered a total failure.

Several unsuccessful attempts were made to establish deer in areas around Lynn Canal in Southeastern Alaska. This program was conducted by the U. S. Fish and Wildlife Service from 1951 to 1956 with funds provided by the Federal Aid in Wildlife Restoration Act. Records of these plants are somewhat vague, but these operations were evidently not well organized. At least three different introductions were made in Taiya Valley near Skagway; one in 1951, one in 1952, and one in 1956. The minimum number of animals moved was five bucks and eight does. However, the actual total is uncertain because four fawns were held for release at a later date. Documentation of the additional releases could not be located.

Between 1951 and 1954, eight deer were released on Sullivan Island in Lynn Canal by U. S. Fish and Wildlife personnel. Again, because of sketchy reporting, it is difficult to obtain exact dates and numbers.

The success of the transplants to the Lynn Canal area is difficult to assess. Few reports of deer have been received from Taiya Valley, but reports of deer are fairly common in the vicinity of Haines (Norm Blank, resident of Haines, pers. comm.). There has been some speculation that the deer seen in the Haines area have worked their way up the coast from the St. James Bay area. In any event, the Taiya Valley transplant cannot be classified as a thriving success.

The Sullivan Island transplant has been somewhat more successful, but not to the extent of those on Hawkins or Hinchinbrook Islands. During the winter of 1963-64, nine deer were observed on Sullivan Island (Norm Blank, resident of Haines, pers. comm.). A U. S. Forest Service report from 1965, however, states that neither Forest Service personnel nor loggers working on the island observed evidence of deer populations (Sigard Olson, U. S. Forest Service, pers. comm.).

Annually, a small number of hunters travel to Sullivan Island and harvest a few deer. Therefore, viewing the transplant strictly from the man-day recreational standpoint, it could be classified as successful.

In summarizing deer transplant efforts in the state, the overall results would have to be classified as good. Huntable populations have been established on Hawkins Island, Hinchinbrook Island, Montague Island, Kodiak Island, Afognak Island, Long Island, Sullivan Island and the islands in Yakutat Bay. Taiya Valley apparently has a few animals remaining.

The only transplant that was a complete failure was the Homer Spit release on the Kenai Peninsula.

Moose

Copper River Delta

The first moose transplant in Alaska was conducted near Cordova on the Copper River Delta. This program was financed by the U. S. Fish and Wildlife Service, but much of the labor was furnished by sportsmen in the Cordova area (Elkins and Nelson, 1954).

From 1949 through 1957, calves were obtained from the Kenai Peninsula, Susitna River drainage, Matanuska Valley and the general Anchorage area. These calves were all picked up by well-meaning citizens who felt that the animals had been abandoned by their mothers. In 1958, calves were captured from the wild for the express purpose of introduction to the Copper River Delta (Robert Rausch, ADF&G, pers. comm.).

Because records are incomplete, it is difficult to determine the number of calves handled, but it appears that a minimum of 50 were obtained and 24 released. The largest single release was that of five moose in 1951 (Nelson, 1951b). Several calves that were actually released, but found dead a few days later and subsequently identified by ear-tag number, are not included in the total number transplanted. Considering the generally poor condition of the calves and the lack at that time of information on rearing moose calves, it is small wonder that calf mortality was high.

The calves were raised by Mr. Hollis Henricks, president of the Cordova Chapter of the Isaak Walton League of America. Mr. Henricks was active in developing successful calf-rearing procedures and in several of his letters outlined his program in detail. Mr. Henricks reported, "information on feeding has been invited from various sources and that from Mr. P. C. Winslow, Pacific Region manager of the Ralston-Purina Company, proved most helpful. Upon his advice we obtained 25 lbs. of Purina Nursing Chow which is a milk supplement and 450 lbs. of Purina Calf Startena which is a grain and protein with molasses included." Major problems encountered by Mr. Henricks were injured and debilitated calves, diarrhea and scouring.

Fortunately, moose were not difficult to observe on the Copper River Delta and a fair record could be maintained on the status of the transplant. As early as October 15, 1950, U. S. Fish and Wildlife Service Game Management Agent Fred Robards reported observing all three moose released to that date (Robards, 1953). Numerous subsequent observations indicated that survival and reproduction were good.

The suitability of the Copper River Delta as moose habitat is reflected by the observation of a cow with calf in the fall of 1952 (Robards, 1953). The cow bred as a yearling and bore the calf as a 2-year-old, a situation that normally occurs only on better moose ranges. By 1954 considerable evidence had been obtained of the successful wintering and breeding of the moose on the Copper River Delta (Elkins and Nelson, 1954).

A limited harvest of this newly established herd was initiated in the fall of 1960. Twenty-five bulls were harvested by permit hunters that year. There was no hunting season in 1961, but in 1962 hunters again took 25 bulls. In 1962 and 1963 registration hunts were conducted. The regulations stipulated that potential moose hunters were to register before and after hunting so that the season would be terminated when the desired harvest had been reached. A 42-day season was provided for the fall of 1965 without registration or permits.

In 1968, the first antlerless season was held, with 10 permits being issued for that area lying west of the Copper River. The number of antlerless permits was increased to 15 west of the river and 25 east of the river in 1969. In 1970, the western area was open for one moose of either sex with a total of 40 permits being issued.

Berners Bay

The second moose transplant in Alaska was conducted in a more organized and deliberate manner than was the Copper River operation. In 1958, the Alaska Department of Fish and Game, U. S. Fish and Wildlife Service and Territorial Sportsmen cooperated with the military to capture and transport calves to Juneau (Nelson, 1959). An Air Force helicopter was used to capture calves in the Susitna and Matanuska Valleys.

Seventeen calves were transported to Juneau in an Air National Guard DC-3 to be reared at the Minfield Childrens' Home at Lena Point. One calf died shortly after arriving at its destination (Nelson, 1959). The rearing process was very successful, however, and 16 calves (5 males and 11 females) were released at Berners Bay on August 15, 1958. One calf died shortly after being released.

No moose transplants were conducted in 1959, but in 1960, 11 additional moose were captured and shipped by the Alaska Department of Fish and Game to Juneau for subsequent release at Berners Bay (Merriam, 1960). The rearing process was not as successful as in 1958 and only six calves survived to be released August 24.

Three cows with calves observed in June 1960 demonstrated the early reproductive success achieved by the animals transplanted in 1958 to Berners Bay (Merriam, 1960). In order to produce calves, these moose bred at approximately 16 months of age and produced offspring when 2 years old.

Because of the excellent reproduction a limited open season on bull moose was established in 1963. Precise kill figures were not obtained, but it was estimated that about four bulls were killed. In 1964, a limited season was again held and 17 persons hunted, killing six bull moose. Since that time, annual seasons have been held with the yearly harvest ranging from 5 to 23 animals. Either-sex hunts, initiated in 1971 to help maintain a balanced sex ratio in the herd, have proved popular with local residents. In 1971, 50 permit holders harvested 23 moose at Berners Bay (20 females and 3 males) and in 1972 the same number of permittees harvested 22 moose including five bulls.

Kalgin Island

In 1957, 1958 and 1959, moose calves were released on Kalgin Island near Anchorage. The techniques differed somewhat from those used at Cordova or Berners Bay. Calves were supplied by the Alaska Department of Fish and Game and reared by Charles and Edith Parsons, who were summer residents of the island (Rausch, 1958). The moose were not confined to a pen, but instead were allowed to roam at will. This procedure permitted the animals to select unlimited quantities of natural feed.

The animals remained in the vicinity and were fed twice daily until the Parsons departed the island in August of each year. Under these conditions the moose acclimated themselves well to the new environment. Freedom to select natural foods probably offsets many nutritional problems that often affect penned animals. It also probably reduced the possibility of disease. During this operation, a male and a female calf were released in 1957 (Rausch, 1958), two females and one male in 1958 (Rausch, 1958), and one male

in June 1959 (Albert Erickson, ADF&G, pers. comm.).

On June 15, 1958, a commercial fisherman reported observing two moose on the island (Rausch, 1958), and a calf was killed by an unidentified fisherman in the summer of 1959 (Robert Rausch, ADF&G, pers. comm.). Moose are still known to exist on the island; however, no information is available on numbers, sex or age composition.

Chickamin River

In response to public interest in a moose transplant in the Chickamin River area, field investigations were initiated in 1962 (Burris, personal files).

Extensive glacier systems at the headwaters of the La Duc and Chickamin Rivers were felt by many to have hindered the movement of moose into this valley. A few moose had occasionally been observed on the Chickamin River, but apparently they were infrequent visitors.

The United States Forest Service, in field investigations in 1962 and 1963, prepared a vegetative type map of the valley (Burris, 1964). This vegetative study suggested that sufficient forage was present to support moose. Snow boards were installed to determine if winter conditions were suitable for moose.

Very little has been documented about the effects of snow on wintering moose in Southeastern Alaska, and a period of 5 to 10 years would be necessary to evaluate seasonal flucutations of snow conditions and their potential effects on moose. Considering the time and money necessary to conduct investigations to accurately predict the outcome of a moose transplant, the Department of Fish and Game considered it more practical to conduct an experimental transplant and closely observe the results.

An agreement to transplant moose to the Chickamin River was established under the Cooperative Agreement that existed between the U. S. Forest Service and the Alaska Department of Fish and Game. Under this arrangement, the Department undertook the actual transplant.

Seventeen moose calves, 11 females and 6 males, were captured in June 1963, on the Chickaloon Flats near Anchorage and transported to Gravina Island to be reared by Mr. David Perry, a local resident (Burris, 1964). An Air Force H-21 helicopter was used to capture the calves and transport them to Anchorage. The calves were held overnight in Anchorage and then shipped to Annette Island on an Alaska Air National Guard C-123 aircraft. A truck transported them from the Annette airfield to docking facilities at Metlakatla where they were placed aboard the Department vessel "Kittiwake." Docking facilities suitable for the "Kittiwake" did not exist at the Perry residence on Gravina and it was necessary to transfer the calves ashore in a skiff.

Initial mortality was high and five calves had been lost by June 19. This initial loss was attributed primarily to excessive handling.

In August, 10 moose were transported in an LCM landing craft (Fig. 1) from Gravina Island to the mouth of the Chickamin River (Burris, 1964). Because the calves became a nuisance to James Wolf, the only resident on the Chickamin River, on August 10 the animals were moved to a new location one and one-half miles up the river. Only 9 of the 10 calves were subsequently relocated to the new site. Of this total, six were females and three males.

Fig. 1. Calf moose being coaxed to LCM landing craft during Chickamin River transplant operation (ADF&G photo).

Additional animals were transplanted to the Chickamin River area in 1964 (Burris, personal files). The operation was similar to that of 1963 except the location of the rearing site was changed and the direct transfer of the moose from Annette airfield to the holding pen was conducted via an amphibious aircraft.

Wet weather and possibly insufficient natural food in the holding pens reduced the number of moose to six (four females and two males). One female calf sustained a broken leg while being loaded into the LCM and was destroyed, reducing the total released to only five of the original 15 animals. A camp was established on the Chickamin River and the moose were fed for a few days until they had become adjusted to the release site.

The moose released in 1963 were last observed as a group about October 7, 1963 (Burris, 1964). Tracks were seen by U. S. Forest Service and Department of Fish and Game personnel on several trips to the Chickamin River from November 1963 through March 1964. One moose was sighted on March 27, 1964 by Forest Service personnel and numerous tracks were observed on May 5. Moose sign was observed throughout the summer of 1964, prior to the second release.

The results of the Chickamin River moose transplant are still unknown. During moose population counts in 1970, however, Department biologists were unable to locate any sign of moose in the Chickamin River drainage. If there are still moose present in the area, their numbers are low.

Kodiak Island

The last attempt to transplant moose in Alaska occurred during 1966 and 1967, when mainland moose were transported to Kodiak Island (Sterling Eide, ADF&G, pers. comm.). In 1966, 27 moose calves were moved to Kodiak to be hand-reared until large enough for a transplant attempt. Only one of these animals, a male, survived and was later released. Efforts were renewed in 1967, with the animals being reared at Palmer. Nine animals were eventually flown to Kodiak; three of these died and six were released on the island. Although moose persisted for several years on Kodiak Island, all of the transplanted animals eventually were killed or died of natural causes.

In summary, two of the five moose transplants attempted in Alaska have been very successful; those at Berners Bay and the Copper River Delta. Both were in fairly extensive habitat only recently made available by glacial recession, and both resulted in flourishing moose populations

Muskoxen

Nunivak Island

The last of Alaska's original muskoxen were killed about 1850-60 (Spencer and Lensink, 1970). Their reestablishment was initiated in April 1927 when the Territorial Legislature of Alaska urged Congress to appropriate money to obtain muskoxen for domestication or husbandry experiments at various locations in Alaska. In May 1930, Congress appropriated $40,000 for the procurement, shipment and extended care of muskoxen for the Alaska project.

On September 15, 1930, 15 bull and 19 cow muskoxen from Greenland arrived in New York City (Spencer and Lensink, 1970). These animals were held in quarantine from September 16 through October 18, then shipped to Seattle by rail. They went to Seward, Alaska, by steamer and from there to Fairbanks by rail, arriving November 5, 1930.

All of these muskoxen were retained at the University of Alaska and, even though at least 19 calves were born, various losses reduced the herd to 31 animals prior to release (Elkins and Nelson, 1954). These animals were ultimately transported to Nunivak Island and released; four in the summer of 1935 and 27 on July 17, 1936. This initial herd on Nunivak consisted of 18 males (12 adults, four 2-year-olds and two yearlings) and 13 females (12 adults and one 2-year-old) (Palmer and Rouse, 1963).

The herd grew slowly at first, but by 1965 there were more than 500 head. Because Nunivak Island is part of the National Wildlife Refuge system, a cooperative management plan was established between the Alaska Department of Fish and Game and the Bureau of Sport Fisheries and Wildlife. This agreement recognizes the desirability of reestablishing muskoxen on the mainland of Alaska and the need to regulate the herd on Nunivak to maintain a healthy, productive nucleus.

Muskox transplants to the Alaska mainland presented certain problems not encountered in the initial plant on Nunivak Island. Although Nunivak is relatively large (approximately 40 miles wide and 70 miles long), the dispersal of the transplanted animals was limited. Group cohesion and social interactions, including breeding, were therefore insured. This is not the case in the vast reaches of the Arctic. Calves transplanted without adults to such large, unconfined areas would tend to disperse widely and few groups would survive the two to five years until the animals were old enough to reproduce. The only logical

approach was the transfer of adult animals, particularly cows, along with the calves.

Nelson Island

In 1967, a pilot program was initiated to develop procedures for transplanting muskoxen (Alexander et al., 1968). The objective of this program was to make an experimental release of up to 30 animals on Nelson Island which is located across Etolin Strait from Nunivak. Personnel on the project included employees from the Department of Fish and Game, Bureau of Land Management and Fish and Wildlife Service plus several local residents from the village of Mekoryuk on Nunivak Island.

A Cessna 180 and a Piper PA-18 were used for reconnaissance and logistic flights and a Cessna T-50 Bushmaster was contracted to transport the muskoxen from Nunivak to Nelson Island. Because of the lack of experience in handling muskoxen, it was decided to work with yearling animals (about 10 months old) until capture procedures were perfected to the point that they could be applied to adult animals.

Snow vehicles were used to herd animals from the dune areas to flat terrain where yearlings were separated from adult animals. Drugs (succinylcholine chloride) administered with a "Cap-Chur" gun were used to immobilize the young muskoxen. They were then hobbled, loaded onto a sled (Fig. 2) and towed by snowmachines to the airstrip. After being crated, they were loaded aboard the Cessna T-50 for delivery to Nelson Island. Because of inclement weather, it was necessary to hold some of the animals for a prolonged period. The muskoxen were kept hobbled in readiness for transport and as a result many became exhausted and exhibited signs of stress. When this occurred, they were released and replaced by freshly captured animals. Some muskoxen were captured by native snowmachine drivers on their own initiative. However, most of these animals were males and were released immediately because emphasis was being placed on the capture of females.

A total of 30 animals were captured on Nunivak Island between March 20 and March 30, 1967 (Alexander et al., 1968). On March 23 and 24, six males and two females, all yearlings, were released on Nelson Island. Of the 30 animals captured, two died from an overdose of drugs and one died from exhaustion.

During March 1968, the second step of the muskox transplant program was undertaken (Jennings, 1969). For this operation, a helicopter replaced snowmachines for herding and capturing animals. The muskoxen were hazed from the dune areas by a Hiller 12E helicopter, which was also utilized to position the gunner so that suitable animals could be immobilized using drug-loaded syringes. As was the case in 1967, succinylcholine chloride was the drug used. In some instances the animal tranquilizer "tranvet" was used to keep the animals tractable. The drugged animals were transported by sling to a temporary runway located on the ice at Duchikthluk Bay at the south end of Nunivak Island. When four to six animals had accumulated, they were placed in plywood crates and flown by Northern Consolidated Airlines' Skyvan to Nelson Island. Between March 17 and 20, 1968, 15 muskoxen were transplanted: five yearling males, nine yearling females and one male about 2 years old. Four fatalities occurred during the transplant, two from overdoses of drug and two when the syringe needle struck vital organs.

It appears now that the Nelson Island muskox transplant was successful. Four calves were born to this herd during 1969 and five calves were observed in September 1970 when the herd numbered some 20 to 30 animals (Jennings and Burris, 1971). A total of 44 muskoxen, six of which were yearlings, were observed during an aerial survey of the herd on May 4, 1973.

Fig. 2. Immobilized muskox lashed to a sled in preparation for trip to airstrip on Nunivak Island (photo by L. B. Jennings).

Mainland Transplants

Because of encouraging results from the experimental transplants conducted in 1967 and 1968, a major transplant was planned for 1969 (Jennings, 1970). Its objective was the reintroduction of muskoxen to historic ranges on the Arctic coast. The Camden Bay area near Barter Island was selected as the release site on the basis of previous favorable range evaluations. This transplant was a cooperative endeavor between the U. S. Fish and Wildlife Service and the Alaska Department of Fish and Game.

Yearlings were captured with the use of snowmachines and lariats (Fig. 3), and adult animals were drugged from a helicopter. The yearlings, after capture, were placed unrestrained in a 16- x 32-foot storehouse. Adults were placed in crates and held for transport. All animals were maintained on hay and snow water.

Between March 25 and April 6, 1969, a total of 53 muskoxen were transported to the Barter Island area using Alaska National Guard C-123 aircraft. The release consisted of 27 males and 25 females. One cow died en route from Nunivak.

During the project, a total of 71 animals were handled. Of this total, 10 succumbed to drugs (succinylcholine chloride and sernylan) and six were released after they showed signs of distress. The high drug loss was primarily due to experimentation with different drugs and dosages and the erratic results obtained with mature bulls.

Shortly after the transplant, Ave Thayer, of the U. S. Fish and Wildlife Service, reported six additional deaths along the coastline near Barter Island. Five of these animals were autopsied. Three appeared to have died from a respiratory disorder, one from a broken pelvis and one from unknown causes.

A second major transplant was conducted in March 1970, again as a cooperative effort between the U. S. Fish and Wildlife Service and the Department of Fish and Game (Jennings and Burris, 1971). The drug sernylan, lariats and heavy nets were used to capture the muskoxen. Utilizing a chartered C-119 aircraft, 36 animals (19 males and 17 females) were moved from Nunivak Island to Feather River on the Seward Peninsula and 36 (17 males and 19 females) to Cape Thompson on the northwest Arctic coast. Only four deaths occurred during this operation.

In 1970 an additional 12 animals were captured in March and held in a corral on Nunivak until June in a test to compare winter and summer transplant operations. Two animals died in the corral, but this loss was partially offset when one of the mature cows gave birth during this period. These muskoxen were released at the Kavik River on the western edge of the Arctic National Wildlife Range.

Although it is too soon to evaluate the success of mainland muskox transplants, early reports from the Barter Island animals are not encouraging. These muskoxen wandered widely and have been observed from the Sadlerochit River in the western part of the Arctic Wildlife Range to Arctic Village (one was shot there by a native in 1969) on the south slope of the Brooks Range. At least six of the 52 animals released on Barter Island in 1969 moved eastward into Canada; two animals were observed at Shingle Point on the northern coast of Yukon Territory and four animals were seen a few miles from the Northwest Territories border.

A 1969 report from Canada tells of a native who shot one muskox believing it was a moose. The animal went down, but soon regained its feet and ran off through the willows.

Fig. 3. For the 1969 muskox transplant, yearlings were "rounded up" using snowmachines and lariats (photo by J. L. Hout, U. S. Fish and Wildlife Service).

The man, never having seen a muskox, stood in awe as this great, shaggy beast crashed through the brush. Returning to his village, he related, in profound terms, how he shot the head "clean off" a moose, and the animal jumped to its feet and escaped. Following initial reports of Canadian Eskimos killing muskoxen, Canadian authorities established a closed season and widely advertised the presence of straying muskoxen.

In 1971 an additional muskox carcass was recovered at Flaxman Island. Apparently the animal had died of natural causes.

The final results of the Barter Island and Kavik River releases will not be determined for many years. It may well be that the animals have become so widely dispersed that an insufficient number will be available in any one herd to establish a population. However, by the end of 1972 it was apparent that at least three groups of muskoxen totaling 28 adults and seven calves remained from this transplant effort. These groups ranged in the following general areas: Group 1 (8 adults and 2 calves) - Canning River drainage; Group 2 (11 adults and 3 calves) - Sadlerochit River drainage; and Group 3 (9 adults and 2 calves) - between the Aichilik and Okerokovik Rivers.

At this early date, reports concerning the Feather River and Cape Thompson transplants are encouraging. By the end of 1970 at least 28 animals from the Feather River transplant (including two calves born in 1970) were alive. On March 3, 1971 a herd of 21 animals, apparently part of the Feather River transplant, was seen near Brevig Mission. Later that year this herd, consisting of four adults, 16 two-year-olds and one yearling, moved to the vicinity of the lower Nuluk River. In 1972 this group wintered near the mouth of the Nuluk River and three additional animals were in residence at the head of Gold Standard Creek near Cape Douglas. By early 1973, however, the group of 21 animals had dispersed and it was felt that there were only 23 to 27 muskoxen still on the Seward Peninsula.

Although the 36 muskoxen transplanted to Cape Thompson in 1970 dispersed widely in small groups, one group of 11 animals was seen periodically near Point Hope by late fall. In addition to sightings of scattered animals throughout 1971, a herd of 13 animals was located along the Kukpuk River in September. Apparently this same group of animals, but now numbering only 11, was observed repeatedly in 1972 in the vicinity of Iviangik Mountain and the Kukpuk River. In July 1973 these 11 animals plus two calves were observed regularly in the vicinity of Point Hope.

Bison

Delta

Alaska's bison population stems from an initial transplant in June 1928. The project to transplant bison to Interior Alaska was an alternate proposal to appease Alaska citizens who had voiced an interest in having deer and elk transplanted to the Interior (Alaska Game Commission, 1929). The U. S. Bureau of Biological Survey, as administrators of the National Bison Range at Moiese, Montana, agreed to ship bison to Alaska, charging only for crating and handling (Alaska Game Commission, 1929). Twenty-three bison (6 males and 17 females) were shipped about the middle of June and arrived June 27, 1928 at College, Alaska (Elkins and Nelson, 1954). Nineteen of the animals were released near McCarty (now Delta Junction) in June 1928 and three were held at the University of Alaska and released in June 1930 (Elkins and Nelson, 1954). Two bison died after being released at McCarty and another died at the University (Palmer, 1935).

The herd grew rapidly and reached its peak in the early 1940's. It then decreased to an estimated low of 250 animals about 1950. Limited harvests were permitted in 1951, 1952 and 1953 by the U. S. Fish and Wildlife Service (Elkins and Nelson, 1954). After statehood, limited harvests have been made in 1961, 1963 through 1965 and 1968 through 1972. Interest in hunting bison has been high and in 1971, for example, there were 3,758 applicants for the 20 permits allowed for the Delta herd.

Sometime in the mid 1940's a few bison from the Delta herd began using the area near Healy Lake, some 29 miles east of Delta. This "herd" now numbers approximately 20-30 animals and apparently is merely a wintering segment of the Delta herd.

Copper River

In 1950, the U. S. Fish and Wildlife Service conducted the first transplant of bison from the Delta area (Nelson, 1950). Procedures used to capture the bison were similar to those employed in other parts of North America. A sturdy corral was constructed and the animals were herded into the enclosure. The bison were then crated, loaded on trucks and transported to the release site at Slana in the Copper River Valley. In this transplant effort, 17 bison (5 males and 12 females) were released in several separate groups. A small number of these became established on the Copper River in the vicinity of Lower Tonsina. This herd slowly increased to a high of about 119 animals in 1970 then declined slightly to about 80 animals in 1971. Limited harvests by permit only were conducted in 1964, 1965, 1968, 1969 and 1970. No harvests were allowed in 1971 or 1972 because of reduced herd productivity during this period. It appears that this trend in lowered production, beginning in 1968, is the result of range deterioration and successive severe winters.

Chitina

In 1962, the Alaska Department of Fish and Game attempted to extend the range of the Copper River bison herd by planting animals in the Chitina River drainage (Burris, personal files). Bison were captured at Fort Greely and transported by air to May Creek, an airstrip near the Chitina River. Thirty-nine were shipped; four died en route, and several succumbed during the first winter which was unusually severe. A few bison still exist in the area, but the highest estimate places the total number at only about 16 animals. No hunting has been allowed on this herd and it is doubtful that the Chitina River transplant will ever produce a huntable population of bison.

Farewell

The Farewell Lake bison herd is the result of two separate transplants. During the first, on August 10 and 11, 1965, 18 bison (5 males and 13 females) were trapped on the Fort Greely Army Reservation, crated and flown by C-123 aircraft furnished by the Air National Guard to the Farewell airstrip (Eide et al., 1967). The second transplant to the Farewell area was conducted August 14 and 15, 1968 (Griffin and Alexander, 1969). This introduction consisted of 12 cows and 8 bulls. Procedures followed were the same as those employed in the 1965 operation.

It appears that the Farewell area may be well suited for bison. Counts in 1971 showed that the Farewell bison herd consisted of 70 to 75 animals, including at least 16 calves. However, only four calves were produced in 1972, apparently because of the severe 1971-72 winter. The first hunt on this herd was conducted in September and October 1972 and resulted in the harvest of 11 animals (10 bulls and 1 cow). Because recent range studies

indicate that not more than 100 bison can be sustained in this area, maintenance of the herd at approximately this size is the Department's goal.

Future bison transplants in Alaska will, necessarily, be limited. With few exceptions, bison range in Alaska is limited to river bars created by glacial streams. Bison summer on such bars almost immediately below the glaciers which feed the streams. In winter, they migrate downstream to the lower reaches of the river. Key wintering areas are associated with windswept sites along these rivers. Wind is essential to prevent excessive snow accumulation. Because of these exacting habitat requirements it is doubtful if many areas in the state exist that will support large numbers of bison. In addition, bison compete directly with domestic livestock for forage and can become a problem in agricultural areas. These factors further limit potential bison transplants.

Elk

Kruzof Island

The first record of attempts to transplant elk in Alaska comes from the 1926 session of the Territorial Legislature. During this session, a sum of $2,000 was allocated to place Roosevelt elk on Kruzof Island in Southeastern Alaska. Available documents indicate that arrangements were made with the Washington State Game Department to obtain elk in trade for mountain goats *(Oreamnos americanus)*. Details of the trade were not recorded.

In September 1926, two yearling elk from Washington State, one male and one female, were released on Kruzof Island (Alaska Game Commission, 1929). A calf was observed there during the early summer of 1927 and this prompted the Alaska Game Commission to renew negotiations with the State of Washington to secure additional elk.

Arrangements were made for an exchange at the ratio of one mountain goat for two elk (Alaska Game Commission, 1929). As a result of this agreement, six calves were shipped from Port Angeles, Washington, to Sitka, Alaska, and subsequently released on Kruzof Island on September 24, 1927. One calf died within three months, and the remaining five were returned to Sitka in January 1928. An extended cold snap with heavy snows necessitated retaining the animals at the U. S. Agricultural Experiment Station at Sitka. In April, the animals were returned to Kruzof Island. Documentation of the results of this transplant was, at best, sporadic. A report by the Alaska Game Commission to the Territorial Legislature, dated March 1, 1931, stated that the elk had shown a slight increase. The report also mentioned the tendency of the elk to wander to adjacent islands and stated that one female elk had been mistaken for a deer and shot. Another Game Commission report to the legislature in 1933 stated: "from the very first these animals have shown a tendency to wander, and to break up into small groups until it is impossible to secure an accurate check on them."

A later report (Alaska Game Commission, 1935) indicated that the elk had left Kruzof Island and crossed over to Chichagof and Baranof Islands. Sporadic reports of elk on these islands were subsequently received for a short while, but by 1937 the Kruzof Island elk transplant was labeled a total failure (Alaska Game Commission, 1937).

Afognak Island

On June 29, 1925, the Territorial Governor approved a program to transplant Roosevelt elk to the Kodiak-Afognak island group. Under the same goat-elk exchange program with the State of Washington that was utilized to obtain animals for Kruzof Island, eight elk

calves (three males and five females) were shipped from Port Angeles, Washington, in late August 1928 (Batchelor, 1965). They were held over the first winter at the U. S. Agricultural Station at Kalsin Bay, Kodiak Island.

The elk did very well in captivity and in March 1929 they were released on Afognak Island. From the beginning, the herd thrived and five calves were reported in the spring of 1930. The Alaska Game Commission's report to the legislature in 1933 stated there were 30 or more elk on Afognak. An estimate made in September 1934 placed the population at 50 to 60 animals, and by January 1, 1937, it was estimated that 100 animals were present on the island (Alaska Game Commission, 1937). On December 3, 1948, 162 elk were observed during an aerial survey and the total population was estimated to be not less than 212 animals (Batchelor, 1965).

As a result of the 1948 survey, a limited harvest of 50 bull elk was recommended for Afognak Island. A permit hunt was initiated in 1950 and 27 bulls were harvested (Elkins and Nelson, 1954). The season was closed in 1951, but other permit hunts were held in 1952 and 1953. After a season closure in 1954, a 15-day bull elk season was set for Afognak Island in 1955. Season length was increased to 20 days in 1957 and 31 days in 1958. In 1959, the first either-sex hunt was held. The population continued to increase and was estimated at 1,100 animals in 1961 (Batchelor, 1965). As the number of elk increased, the hunting seasons became more liberal. In 1963, a season of 153 days was established with a bag limit of two elk in the Tonki Cape area.

In spite of liberalized hunting seasons and bag limits, the Afognak Island elk herd has followed the course often associated with transplanted animals. Population numbers reached a peak of approximately 1,200 to 1,500 animals by 1965 and subsequently underwent a sharp decline (Griffin and Alexander, 1969). A series of winters with heavy snow accumulation resulted in extensive natural mortality and reduced calf production and survival (Alexander, 1973). The population probably numbered about 450 animals in 1972.

Revillagigedo Island

In the Executive Officer's report to the Alaska Game Commission in 1937, it was stated that four elk from a park in Seattle had been released at Ward Creek on Revillagigedo Island in May 1937. The transplant was a cooperative effort between the sportsmen of Ketchikan and the Alaska Game Commission. A favorable report of the transplant was made in December 1937 and on June 27, 1938, W. R. Selfridge of Ketchikan reported in the Executive Officer's report to the Alaska Game Commission that: "The elk in Ward Valley are doing fine." Two years later, however, the Executive Officer's report listed the transplant as a failure. No explanation or further details of the transplant and its subsequent failure were provided.

In 1963 the Alaska Department of Fish and Game made another attempt to transplant elk to Southeastern Alaska by asking the U. S. Forest Service for permission to transplant elk to Kruzof Island. The Forest Service refused, however, and the two agencies subsequently agreed on Revillagigedo Island as a suitable site (Burris, 1964). A feasibility report specifying the release site as Fire Cove in Neets Bay was submitted to the U. S. Bureau of Sport Fisheries and Wildlife for subsequent approval so the project could be conducted with Federal Aid in Wildlife Restoration funds. Holding pens were constructed at Fire Cove and the entire operation was similar to the 1962 elk transplant to Gravina Island (Burris, 1964). In August 1963 nine calves were transferred from Afognak Island to Annette Island where they were held in pens for a short period and subsequently released

at Neets Bay. The elk were observed in the vicinity of the release site for a few weeks, but they soon dispersed to the area around Neets Creek.

Somewhat encouraged by the results from the 1963 transplant to Neets Bay, the Department made a second transplant to the same area in 1964 (Burris, personal files). The operation was conducted as before except that a larger pen was constructed near Neets Creek. Drainage, exposure and forage were much improved at the new holding pen. Fourteen elk calves, six males and eight females, arrived at Neets Bay on July 13, where they were held until September 1964. All 14 animals were in good physical condition when they were released.

The final status of the elk transplant on Revillagigedo Island is still unknown. Occasional reports of tracks and droppings sift in to Department offices, and observations of animals have also been reported, although these sightings have not been verified. Apparently some animals remain on the island, but because of the rugged terrain and the heavy vegetative cover, the exact number is unknown.

Gravina Island

After the failure of the 1937 elk transplant to Revillagigedo Island no further efforts were made in Southeastern Alaska until 1962 when the Alaska Department of Fish and Game and the U. S. Forest Service cooperated in an elk release on Gravina Island.

In June 1962, 11 calves were captured on Afognak and Raspberry Islands in the Kodiak Island group (Batchelor and Merriam, 1963). This operation involved a cooperative effort by the Alaska Department of Fish and Game, the U. S. Coast Guard Air Detachment of Kodiak and the 80th Transportation Company, United States Army, Fort Richardson. The Coast Guard supplied a Bell HUL three-place helicopter and a two-man crew, while the Army provided an H-21 helicopter.

The capture operation, while simple to describe, was difficult to accomplish. First a herd containing calves was located by use of the helicopter. A crew was then landed several hundred yards ahead and uphill from the herd. The pilot then hazed the animals in the direction of the crew, hoping that one of the calves would lag behind and become separated from the herd. When this occurred, the calf would seek shelter in the tall grass or alders and the helicopter would hover over the location while the capture crew approached on the ground. The crew, receiving verbal instructions from the helicopter pilot, cautiously approached the hidden calf, and pounced, hopefully landing on the animal. All calves were held at the Afognak Lake Naval Recreation Camp for approximately two weeks prior to their shipment to Gravina Island.

The care and feeding of elk calves is a relatively simple process. A standard livestock starter pail equipped with a rubber nipple was used initially to feed vitamin-supplemented evaporated milk to calves. Within three days nearly all the calves would take milk directly from the pail without the aid of the nipple, and Karo (corn) syrup and Pablum (a baby cereal) were added to the undiluted evaporated milk. The calves were fed three times daily for the first four days after which the schedule was reduced to twice daily. Scouring was successfully treated with a commercial antiscouring medicine. Under this care, weight gains often exceeded a pound per day.

The calves were taken to the Kodiak Naval Station in a chartered Grumman Goose aircraft and then transported to Annette Island in Southeastern Alaska via a Coast Guard C-123 aircraft (Batchelor and Merriam, 1963). At Annette Island, the calves were transferred

to a Coast Guard truck, hauled to the village of Metlakatla, placed aboard the "M V Kittiwake," taken to Gravina Island and transferred to a holding pen at the David Perry residence. They were held at the Perry residence until large enough to release.

One female died en route to Annette Island, and two more calves died prior to release. Finally, on August 31, 1962, five male and three female calves were placed aboard a Coast Guard LCVP landing craft and released at Vallenar Bay, Gravina Island.

The three months in captivity did a great deal for the calves' physical condition, but during that period the animals lost their fear of people. Because of this, the young elk became nuisances around one of the homesteads on Gravina Island. Finally, on January 30, 1963, the Gravina Island elk transplant was terminated when the homesteader shot all eight calves.

Caribou

Adak Island

In response to a request from the National Military Establishment in 1958, the U. S. Fish and Wildlife Service and the military cooperated in a project to transplant caribou *(Rangifer tarandus)* to Adak Island (Jones, 1966). The Fish and Wildlife Service supplied personnel to capture the caribou and to supervise the project while the military provided transportation.

Because of the expense and difficulty involved in transplanting adult animals, it was decided to capture newborn calves and hand-raise them until they were self-sufficient (Jones, 1966). The calves were captured from the Nelchina herd using Air Force helicopters and transported in Navy cargo aircraft to Adak, a distance of nearly 1,400 miles. The calves were reared on Adak Island by military personnel from the Marine Barracks and the Special Services Department of the Navy Base.

Initial mortality of calves was very high with most loss occurring within the first two weeks (Jones, 1966). Mortality was 68 per cent in 1958 and 69 per cent in 1959. Two-thirds of the loss occurred within the first 48 hours. In 1958, 31 calves were captured and ten were released (seven females and three males). Forty-five were captured in 1959 and 14 released (five males and nine females).

By 1967, the population was estimated at 189 animals (Hemming, 1971). At latest report (fall 1972) this herd had expanded to 347 animals. Adak caribou apparently have achieved optimal growth and an adult bull weighing 700 pounds (whole body weight) was killed in 1968 (Hemming, 1971).

Reindeer in some insular situations have increased beyond the carrying capacity of their range resulting in drastic population crashes. The reindeer herd on St. Matthew Island, for example, increased from 29 animals in 1944 to over 6,000 in 1963. During the winter of 1963-64 this population crashed to less than 50 animals (Klein, 1967). No natural predators of caribou exist on Adak Island and, if the hunting pressure is not sufficient to control caribou numbers, a rapid increase and subsequent crash is likely to occur.

In an attempt to hold the population below the critical level on Adak, the Board of Fish and Game authorized the first hunting season for the period August 15 - August 25, 1964. Under the stipulations of this hunt, 10 permits were issued for the taking of bull caribou only. In 1965, the season was lengthened to 17 days and the bag limit changed

to one bull with no permit requirement. Another change in 1966 set a limit of 30 caribou, but allowed the taking of either sex. In 1967, the allotment was raised to 50 animals of either sex and a bag limit of two caribou was established. The objective of the management plan for the Adak caribou herd is to hold the population at between 200 and 250 animals by harvesting approximately 50 animals annually. In late 1972 it became apparent that this harvest was inadequate to maintain the population at the desired level and efforts were made to attain a larger kill. Total population and mortality figures for the Adak herd are presented in Table 1.

Kenai Peninsula

Historical records show that caribou occurred on the Kenai Peninsula until about 1913 (Spencer and Hakala, 1964). Although the reasons for their extirpation from the Peninsula are not clear, it has been suggested by Leopold and Darling (1953) that widespread fires may have had a dominant influence.

In 1952, a U. S. Fish and Wildlife Service survey resulted in the conclusion that range conditions on the Kenai Peninsula would again support caribou (Alaska Game Commission, 1952). The concept of a caribou transplant to the Kenai Peninsula was dormant for the next several years, however, until 1964 when a reevaluation of the potential release sites was made by the Alaska Department of Fish and Game, the U. S. Bureau of Sport Fisheries and Wildlife and the U. S. Forest Service (Lentfer, 1965). In accordance with Federal Aid in Wildlife Restoration requirements and because it was anticipated that the caribou would wander over considerable areas of the Peninsula, cooperative agreements covering the introduction and management of the caribou were signed between the three agencies. The actual transplant was conducted by personnel of the Department of Fish and Game with funds provided by the Federal Aid in Wildlife Restoration Act.

Caribou in Newfoundland had been successfully immobilized using the drug succinylcholine chloride and, on this basis, a preliminary attempt to capture caribou was made on April 15, 1965 (Glenn, 1967). The attempt proved that the technique was practical and the actual transplant was planned for late April that year.

This operation, initiated on April 27, resulted in the capture of 15 caribou (12 cows and 3 bulls) ranging in age from 11-month-old calves to large adults; these animals were released on May 2, 1965 (Glenn, 1967). Thirty-two animals were actually removed from the herd at Nelchina. Seven were killed initially by the effect of the drug, seven died in handling or en route to the release site and three escaped from the temporary holding facilities.

The release site was in the area between the Chickaloon River and Mystery Creek, north of the Sterling Highway. Many of the adult females were pregnant and calves were born only a few weeks after the release.

In April 1966, 29 more caribou (26 cows and 3 bulls) from the Nelchina herd were released at Watson Lake near Sterling (Glenn, 1967). For a few years following these transplants caribou were observed over a wide area of the Kenai Peninsula from Anchor Point to near Hope. By 1969, however, the animals had become established into two discrete groups. One group, considered the American Pass band, ranges the alpine area west of the headwaters of Resurrection Creek on a year-round basis. It numbered 119 animals in November 1970, 162 animals in November 1971 and at least 214 animals in December 1972.

Table 1. Total population and annual mortality - Adak caribou herd.

Year	Year End Population	Mortality		
		Natural	Hunting	Total
1958	10	1	0	1
1959	23	1	0	1
1960	-[1]	0	0	0
1961	-	1	0	1
1962	36	0	0	0
1963	43	0	0	0
1964	65	1	4	5
1965	87	8	2	10
1966	106	3	18	21
1967	126	1	24	25
1968	163	3	55	58
1969	167	0	51	51
1970	213	0	53	53
1971	230	3	45	48
1972-73[2]	268	1	98	99

[1]No census made.
[2]Season extended through May 1973 to attain additional harvest Year end population figure based on count of 347 animals on October 6, 1972 minus mortality of 79 animals after that time.

A small group, now numbering about 30 caribou, inhabits the muskeg area northeast of the Kenai Municipal Airport in the summer and fall months and the Moose River flats for the remainder of the year.

In 1972 the first harvest of Kenai caribou was allowed and 20 permit-bearing hunters took six bulls. Although the original study in 1952 by the U. S. Fish and Wildlife Service estimated the range carrying capacity at about 200 animals, present indications are that the range will support a greater number. The phenomenal growth of this herd, particularly the American Pass group, necessitates close scrutiny of these animals so that adequate harvests will be achieved, thereby limiting herd size to the optimal level.

Mountain Goat

Baranof Island

Mountain goat transplants in Alaska began in 1923 when 18 animals were moved to Baranof Island (Elkins and Nelson, 1954). The original report of this operation is not available, but apparently the program was under the direction of the Office of the Governor. Animals for this transplant were captured in the vicinity of Tracy Arm on the Southeast mainland.

The annual report of the Alaska Game Commission in 1927 stated that a herd of mountain goats had been observed on the south end of Baranof Island. In August 1930 a trapper from Sitka reported seeing a lone "billy," but the records do not indicate its exact location (Alaska Game Commission, 1931). Success of the plant was not recognized until 1937 when 41 goats were observed on the island (Alaska Game Commission, 1937). The first open hunting season was proposed in the Executive Officer's report to the Alaska Game Commission in 1946, but hunting was not allowed until 1949 (Nelson, 1953). At present, the open season extends from August 1 through December 31 with a bag limit of two goats. Annual harvests average about 20-30 animals and in 1970 the Baranof Island population was estimated to be 250-275 goats.

Kodiak Island

The Kodiak Island mountain goat transplant is a fine example of patience and perserverance. The initial transplant proposal came from a variety of sources including sportsmen's organizations, the Alaska Game Commission and the U. S. Fish and Wildlife Service.

Preliminary studies, funded by the Federal Aid in Wildlife Restoration program, began in 1948 (Nelson, 1953). Potential live-trapping locations were investigated throughout goat range in Alaska. Most areas were eliminated from further consideration because of unsuitable terrain. Day Harbor, on the Kenai Peninsula, was finally selected as an adequate trapping site. In September 1949, U. S. Fish and Wildlife Service personnel erected a corral trap on the west side of the river draining Elsworth Glacier. Thus began the first of many attempts to capture goats for the Kodiak Island transplant (Nelson, 1953).

Because of the rugged terrain the trap could not be constructed on an established goat trail, and its effectiveness was dependent upon finding a bait that would entice the animals into the trap. Various baits, including salt, were used with no success. Finally, the corral trap program was abandoned.

During this same period, padded steel traps were set along established trails and attempts were made to drive the animals down the trails and into the traps. Many difficulties were encountered. The goats did not drive well, they did not readily step in the traps,

and when they finally did, the traps would not hold them. These attempts were soon abandoned also.

In spite of the difficulties encountered obtaining animals, public interest in transplanting goats to Kodiak Island remained high. In 1950, permits were offered to anyone who wanted to capture goats, with the stipulation that the federal government would pay for all animals obtained (Nelson, 1953). No goats were captured.

In 1951, the same offer was made to furnish permits and pay for any goats delivered. Four contracts were issued between the period January 1 and April 30. Bids varied from $150 per kid to $200 per adult female delivered in good condition. Again, there were no goats taken. Two more permits were issued for May and June 1951 with the same result, no goats.

Finally, in 1952, Martin Goreson captured two mountain goats near Seward using nylon snares (Nelson, 1953). These animals were released in February 1952, at Ugak Bay on Kodiak Island. There was only one problem: they were both males.

Not to be discouraged, Fish and Wildlife Service personnel made a new effort in June 1952 (Nelson, 1953). Nylon snares and a salmon net were utilized in further unsuccessful attempts. A "nanny" was shot and great efforts expended to catch her newborn kid - without success. Finally, attempts were made to corner adult goats and lasso them. In very short order these efforts were abandoned because of the hazard to project personnel.

In August 1952, an unusual occurrence provided one more goat for Kodiak Island (Nelson, 1953). Three goats were observed swimming in Cooper Lake on the Kenai Peninsula. Fish and Wildlife Service personnel, in a Grumman Widgeon, landed on the lake and captured one of the animals. Their joy was short-lived, however, when it was discovered that this animal was also a male. Because of the difficulty in obtaining animals, it was decided that no opportunity should be ignored, so on August 15, 1952, the lone animal was released on Kodiak Island.

During the spring of 1952, two other male goats were obtained from individual trappers around the Seward area (Nelson, 1953). In November 1952, another male was captured in the Eagle River drainage near Anchorage followed by a female from the same area in December. As of January 1, 1953, seven goats (six males and one female) had been released in Hidden Basin, Ugak Bay, on Kodiak Island.

From March 19, 1953 through April 11, 1953, ten more animals (one male and nine females) were captured by trappers in the Seward area and released on Kodiak Island (Nelson, 1953). The increase in the number of females captured in 1953 was undoubtedly due to the difference in fees being offered for males and females. Prior to November 1, 1952, the going price was $350 per animal. After that date the amounts paid were $100 per male and $400 per female.

Survival of the transplanted animals was, at first, doubtful. Willard A. Troyer, who then was refuge supervisor of the Kodiak National Wildlife Refuge, reported that during the severe winters of 1955 and 1956 only one female and a few males were seen in the Hidden Basin area (Nelson, 1957). The population slowly increased, however. On October 2, 1964, 26 goats, including eight kids, were observed during an aerial survey. The counts continued to rise with 54 observed in 1966, 58 in 1967 and 71 in 1968. On July 27, 1972 this population numbered a minimum of 91 goats including 27 kids. Aerial counts made in 1972 indicate that this population is extending its range southward

and westward from the Hidden Basin area and is rapidly expanding in numbers.

During the 1968-69 regulatory year, the first open hunting season for goats was established on Kodiak Island. Ten permits were issued and six goats were harvested. Again in 1969 six goats were taken by 10 permittees, and 15 permit holders took five goats in 1970. In 1971, a harvest of four goats was obtained by 25 permittees and 40 permittees took 10 animals in 1972.

Chichagof Island

Kodiak Island was not the only location that was being considered by the U. S. Fish and Wildlife Service for goat transplants in 1952. On September 17 that year, an offer was made to purchase live mountain goats for a planned transplant to Chichagof Island in Southeastern Alaska (Nelson, 1952a). Delivery would be accepted at Juneau, Sitka, Petersburg, Wrangell, Skagway or Haines at a price of $200 per male and $400 per female. The Fish and Wildlife Service requested that the animals be delivered in lots of three.

Five goats were obtained under this program, but two died before they could be released. The remaining three were all females.

On August 13, 1953, the offer to purchase goats was reissued as a Federal Aid development project. Glenn Williams of Anchorage captured two females and two males that were released at Basket Bay on Chichagof, November 22, 1954 (Nelson, 1954).

In September 1955, the offer to purchase goats was again revised (Nelson, 1955b). The announcement named Juneau as the sole delivery point and the price for the animals was increased to $210 per male and $410 per female.

Although the records are not complete as to the locations where the animals were captured, it is well documented that 25 animals were actually released on Chichagof Island. Three goats were later found dead near the release site. Excluding the mortalities, 11 females and 11 males were released (Nelson, 1959). Nine of the goats that were ultimately placed on the island were captured as kids and hand-raised until they were five or six months old.

The first report of goats on Chichagof Island was made by Ernest Lathram, a geologist with the U. S. Geological Survey, who photographed one of the animals on a peak between Trap Bay and Kook Lake on August 4, 1957 (Nelson, 1958). Personnel from the U. S. Forest Service reported observing five goats on Chichagof Island in November 1962 (Jones and Merriam, 1963). Ken Loken of Channel Flying Service, Juneau, reported seeing a goat between Basket Bay and Tenakee in November 1964 (pers. comm.).

At present, the exact status of this goat population is unknown. Unconfirmed reports of a few animals are received occasionally, but no large bands have been reported. Department of Fish and Game biologists have observed no goats on Chichagof Island in recent years and it is believed that few, if any, remain on the island.

Dall Sheep

Official recognition of the idea of a Dall sheep *(Ovis dalli)* transplant in Alaska was first given when the Territorial Legislature established its stocking program in 1925. In December 1950, Clarence J. Rhode, Regional Director of the U. S. Fish and Wildlife Service, compiled a list of transplant proposals received up to that time. Two sheep

transplants were listed, one of which was for sheep to be introduced on Kodiak Island. This project was not given serious consideration at that time because of the need for further investigation and the obvious expense of such a transplant.

Because of renewed local interest, the Department of Fish and Game, through Federal Aid in Wildlife Restoration Project W-11-D-2, conducted a feasibility study of the proposed transplant of Dall sheep to Kodiak Island. Field observations of the range were made at various times of the year and climatic records were examined to obtain knowledge about snow conditions on prospective winter ranges (Burris, personal files). A range analysis had previously been conducted on Kodiak Island. Although this study indicated that a transplant would likely be unsuccessful, public interest at Kodiak was not to be denied.

Agreements were prepared and approved by the U. S. Bureau of Sport Fisheries and Wildlife Refuge Supervisor to allow the removal of sheep from the Kenai National Moose Range and their subsequent release on Kodiak National Wildlife Refuge. An agreement was also made with the U. S. Forest Service to allow the removal of sheep from Forest Service property on the Kenai Peninsula.

The first attempt to capture Dall sheep was made in September 1964 (Burris, personal files). Several techniques were considered such as erecting traps, snaring along established trails, immobilizing sheep with drugs at natural licks and several other possibilities. The method which seemed to hold the most promise was immobilizing the sheep with drugs administered from a helicopter.

Problems with drugs and dosages were encountered during the first attempt in 1964 and the project was cancelled after the project leader was injured. One ewe sheep was captured and released on Kodiak Island that year. Another attempt to refine techniques or devise new ones was made in February 1965 (Burris, personal files). Different drugs were employed and an attempt was made to capture the animals by herding them into deep snow. Sernylan was found to have considerable promise but later proved to be unavailable in sufficient quantities. Attempts to drive the sheep into deep snow met with little success.

A second full-scale attempt to capture Dall sheep was made in May 1965 (Nichols, 1968). Again the technique was to administer immobilizing drugs from a helicopter. Effective dosages of succinylcholine chloride were determined and this drug was employed throughout the second attempt.

Twenty sheep were captured and 13 were transported and released on Kodiak Island (Nichols, 1968). Six of the 20 died from the effects of the drug and stress of handling and holding. In the course of routine testing for brucellosis and other diseases, it was determined that one sheep had a suspect test for brucellosis and this animal was not transplanted.

Effective dosages of succinylcholine chloride were between 15 and 25 mg; 20-25 mg were required for larger adult ewes, while dosages of 15-20 mg were satisfactory for lambs and young rams. The lambs were approximately 1 year old and weighed 43-57 pounds. Adults weighed 110 to 125 pounds. Two- to three-year-old rams suitable for transplanting were approximately the same weight as adult females. Immediately after the effects of the immobilizing drug had begun to wear off, tranquilizers were administered to prepare them for the helicopter flight to the airstrip. Once there they were restrained by placing soft leather collars about their necks and tethering them to trees. Within a short period of time the animals would cease struggling and lie quietly.

Transportation of the animals to Kodiak Island was accomplished with a Department of Fish and Game Grumman Goose. Animals which were held at the airstrip were hobbled and loaded aboard the airplane and released on the beach at Uganik Bay. Transportation and release were well coordinated and on the last day the animals captured in the morning were released in the afternoon.

Mortality after the animals were released was high. At least seven of the sheep had died by May 22, 1965. The high mortality was attributed to the relatively poor physical condition of the sheep that season.

In 1967 two additional sheep were captured on the Kenai Peninsula and transplanted on Kodiak Island (Nichols, 1968). As in 1965, attempts to capture sheep resulted in excessive mortality. It was recommended at that time that no further sheep transplants be attempted until adequate capture techniques were perfected.

A report on the transplant, received in the summer of 1966, indicated that a ram, ewe and newborn lamb had been seen at the headwaters of Barling Bay, approximately thirty miles from the release site at Uganik Bay (Burris, personal files).

FURBEARERS AND SMALL GAME

Because early Russian settlers recognized the potential of the Aleutian Islands for raising foxes, transplants of these furbearers were the earliest of game transplants in Alaska (Murie and Scheffer, 1959). The release of foxes on unoccupied islands continued after purchase of Alaska by the United States, and this practice was extended to several other furbearer species. These transplants, motivated by the high economic value of furs, began to decrease as the fur market declined in the late 1940's. More recently the U. S. Fish and Wildlife Service and the Alaska Department of Fish and Game reinstituted furbearer transplants; in this instance the goal was reintroducing sea otters into former ranges.

Few of the furbearer transplants made in the 1900's could be considered successful. Many were made to marginal habitats and, even though introductions of the transplanted species were successful, resulting populations were not capable of supporting large harvests or even attracting trapping effort. Even in instances where harvestable populations resulted from introductions, for example martens *(Martes americana)* in Southeastern Alaska and beavers on Kodiak Island, declining wild fur markets resulted in only slight utilization of these populations.

Not only were many transplants of furbearers failures but in several instances these introductions were detrimental to the native fauna. For example, depredations by foxes on ground nesting bird populations in the Aleutian Islands have had a tremendous impact on several avian species (Murie and Scheffer, 1959). The Aleutian Canada goose *(Branta canadensis leucopareia)*, which is presently considered to be in imminent danger of extinction, represents an outstanding example of how transplants can "backfire." Transplanted foxes and unintentionally introduced rats *(Rattus norvegicus)* have drastically reduced this island nesting subspecies.

The motives underlying past transplants of small game species like hares, rabbits and squirrels are less evident than those for furbearers, but it is clear that many such introductions were made to provide food for carnivorous furbearers and additional hunting opportunities for local residents.

Fox Transplants

Commencing with the Russian occupation of the Aleutian Islands and continuing until 1932, numerous releases of foxes were made in the Aleutians (Table 2). Unfortunately few records were kept by the individuals conducting these rather casual transplants (Elkins and Nelson, 1954). It is apparent, however, that red foxes *(Vulpes fulva)* occurred naturally west to Umnak Island and Arctic foxes *(Alopex lagopus)* were native only to Atka and Attu Islands (Murie and Scheffer, 1959).

Early Russian introductions were apparently limited to the dark color phases of the red fox ("silver" and "cross" foxes). Foxes from these transplants occurred on Great Sitkin, Kanaga, Amlia, Adak, Seguam and possibly other islands but were later eliminated to facilitate introduction of Arctic ("blue") foxes (Murie and Scheffer, 1959).

Blue fox introductions were much more successful, and populations became established on all of these islands except Kiska. The earliest successful introduction of record was on Atka Island. At present blue foxes are not found on Buldir, Amchitka, Davidof, Chagulak, Anagaksik, Little Kiska and Agattu Islands (Robert Jones, Manager, Aleutian Islands National Wildlife Refuge, pers. comm.). Populations on Amchitka and Agattu Islands were recently exterminated by the Bureau of Sport Fisheries and Wildlife as part

Table 2. Recent Aleutian Island fox transplants (Robert Jones Manager. Aleutian Islands Natl. Wildl. Refuge, pers. comm.).

Island	Year	Island	Year
Adak	1924	Kasatochi	1927
Agattu	1923	Kiska	1926
Aiktak	1921	Little Sitkin	1923
Amatignak	1923	Little Tanaga	1922
Amchitka	1921	Ogliuga	1913
Amlia	1927	Poa	1920
Amukta	1925	Pustoi	1932
Asuksak	1929	Rat	1922
Avatanak	1920	Rootok	1913
Aziak	1927	Sagchudak	1914
Baby Islands	1922	Salt	1916
Bobrof	1930	Seguam	1924
Chugul	1923	Segula	1920
Gareloi	1925	Semichi	1911
Great Sitkin	1925	Semisopochnoi	1922
Herbert	1921	Tagadak	1925
Hog	1916	Ugamak	1922
Igitkin	1922	Ulak West	1915
Ilak	1921	Uliaga	1930
Kagalaska	1921	Umak	1921
Kagamil	1923	Umnak	1931
Kaligagan	1921	Unalga East	1914
Kanaga	1925	Unalga West	1915

of their program to increase existent populations of the endangered Aleutian Canada goose.

Elkins and Nelson (1954) reported that the islands of Prince William Sound also underwent a period of fox farming and as a result by 1908 Green Island had lost all of its indigenous mammals except one species of shrew *(Sorex* sp.*)*.

Additional releases of foxes by fox farmers and other citizens have been made throughout the state, but results of these ephemeral transplants are not recorded. Because foxes already occupied many of the transplant sites it is impossible to determine the impact, if any, of such introductions.

Muskrat Transplants

The first attempt to transplant muskrats in Alaska was made in 1913 when animals from the Nushagak area were transported to several of the Pribilof Islands (Elkins and Nelson, 1954). This operation was a complete failure (Preble and McAttee, 1923).

During the summer and fall of 1925 personnel of the Alaska Game Commission conducted a muskrat transplant from the Copper River area to the Kodiak area according to the 1926 Executive Officer's Report to the Alaska Game Commission. Of the 100 animals shipped from Cordova 30 were lost in transit. The remaining 70 were released at the following locations in the Kodiak Archipelago: Clark's Lake, Kodiak Island; Potatopatch Lake, Kodiak Island; Monk's Lagoon, Spruce Island; Litnik Lake, Afognak Island; and various ponds on Whale Island.

In 1929, as a result of a nuisance complaint on Long Island, 29 muskrats were captured and later released on the Buskin River, Kodiak Island and at Afognak Lake, Afognak Island (Alaska Game Commission, 1931).

The 1943 Executive Officer's Report to the Alaska Game Commission described the Kodiak populations as "Excellent; abundant and spreading." At present, even though muskrats are well established on the Kodiak Archipelago, the actual harvest is so low that this transplant must be considered an economic failure.

An attempt by the Alaska Game Commission in 1929 to introduce muskrats on Prince of Wales Island in Southeastern Alaska was the last recorded muskrat transplant in the state. Although a report by Elkins and Nelson (1954) lists two different releases during this operation it appears that there was only one such release. About 18 muskrats were captured at Haines and transported to Klawak Lake (Alaska Game Commission, 1931). Some of these animals were lost en route because of inclement weather. Although a few of the muskrats were still surviving in 1937 the transplant was considered an absolute failure in the 1942 Executive Officer's Report to the Alaska Game Commission.

Beaver Transplants

Alaska's first recorded beaver transplant occurred in 1925 (Elkins and Nelson, 1954). Under a program authorized by the Territorial Legislature the Alaska Game Commission circulated bids to capture beavers for transplants to Kodiak Island. The contract was eventually let at $50.00 per beaver delivered to Cordova for a maximum of 40 beavers. Thirty-four animals were delivered but 10 escaped or died before release on Kodiak. Seven of the remaining 24 were liberated at Clark's Lake and 17 were released into the streams entering Kalsin Bay (Elkins and Nelson, 1954). This transplant eventually resulted in a harvestable population of beavers on Kodiak Island.

Concurrent with the Kodiak transplant, attempts were made to move beavers to Baranof and Chichagof Islands in Southeastern Alaska. Although this project was organized in the same fashion as the Kodiak transplant, it was stymied in 1925 because no satisfactory bids were received and in 1926 because the contractor failed to capture beavers. A second contractor in 1926 was no more successful than the first, but a third 1926 contract resulted in 10 beavers being captured on Prince of Wales Island. These animals were released near Goddard Hot Springs on Baranof Island in 1927 (Elkins and Nelson, 1954). As a result of this transplant small beaver populations were established on Baranof Island.

Because of the already apparent success of the 1925 transplant of beavers to Kodiak Island, the Alaska Game Commission, using Territorial funds, decided to extend beavers to Raspberry Island near Kodiak. Twenty-one beavers trapped near Cordova were released on Raspberry Island in 1929 (Elkins and Nelson, 1954). At present this species is well established on Kodiak, Afognak and Raspberry Islands, and there is a liberal trapping season with no bag limit on the entire Kodiak Archipelago. Low fur prices have minimized the economic returns from these transplants, however.

Undoubtedly there have been other beaver transplants of minor consequence in Alaska, but adequate documentation of such transplants is lacking. For example, in the 1929 report by the Alaska Game Commission to the Territorial Legislature it is noted on page 7 that "The beaver placed on Kruzof Island under 1925 Project No. 3 are fulfilling all expectations in the increase and spread to surrounding areas." With no further information available it must be assumed that this was a mistaken reference to the beavers transplanted to Baranof Island in 1927. Another even more questionable report indicated that beavers had been released at Yakutat Bay. Beavers do not presently occur in this area.

Marten Transplants

Transplants of martens in Alaska commenced in 1934 with a program proposed by the Alaska Game Commission through the Bureau of Biological Survey and the Civil Works Administration (Alaska Game Commission, 1935). The Federal Emergency Relief Administration provided an allotment of funds to the Office of the Governor for this program designed to provide jobs for unemployed Alaska natives. This program, which had for its goals transplants of martens, deer and rabbits, employed a maximum of 86 persons from the period December 1933 until May 1934. The first project was a marten transplant. Crews stationed near Ketchikan on Behm Canal and near Petersburg at Thomas Bay captured a total of 17 martens which were released on Prince of Wales Island (10) and Baranof Island (7). Despite the relatively small number of animals released, these transplants were successful in establishing martens on these islands (Elkins and Nelson, 1954).

Presently Southeastern Alaska marten populations are high in both native and transplanted ranges. Unfortunately, however, declining fur prices, the rather low quality of pelts from this area and decreased trapping pressure have obviated the benefits of these transplants. Martens contribute only slightly to the economy of Southeastern Alaska, and from the standpoint of economic gain these transplants must be considered failures. Increased interest in recreational trapping may somewhat make up for this shortcoming, however.

Elkins and Nelson (1954) reported that two marten transplants were conducted in the early 1940's, one to Kayak Island and the other to Patterson Island. Neither of these transplants can be verified with existent documentation and no reports have been received of the current presence of martens on either island.

Efforts to introduce martens on Chichagof Island were initiated in 1949 when two males and four females obtained from Baranof Island were released there (Elkins and Nelson, 1954). In 1950 a project initiated by the Alaska Game Commission and financed under Federal Aid in Wildlife Restoration Development Project W-4-D-1 resulted in the capture of one marten near Ketchikan and its subsequent release at Pelican on Chichagof Island on March 19, 1951 (Nelson, 1951b). Three additional martens were purchased from Mr. John Swiss of Polly Creek, Alaska, and released at Pelican on April 30, 1951 (Nelson, 1951b). Later that year six more martens were released at Gould Harbor and Pelican. In February 1952 three martens from Wrangell and one from Petersburg were released at Pelican. One more marten was released at the same site that year, bringing the total to 15 (Elkins and Nelson, 1954).

At present martens are abundant, at least in certain locations, on Chichagof Island; but, as with the Baranof and Prince of Wales Islands transplants, these animals have not provided important economic benefits.

After completion of the Chichagof Island transplant, efforts were initiated under Federal Aid in Wildlife Restoration Development Project W-4-D-3 to introduce martens from the Lake Minchumina area to Afognak Island (Nelson, 1952b). This effort was conducted in a more efficient manner than earlier marten transplants, and all animals were taken from an area which had traditionally produced high quality marten furs. The sex and age class of each animal was determined and each was ear-tagged prior to release. In September 1952 eight martens were released on Afognak Island. Five more were transplanted on October 29; five on December 5 and two on December 29. Eight of these 20 animals were males and the remainder were females.

The outcome of the Afognak Island release is still not fully understood. Enough marten observations have been reported, however, that this transplant cannot be considered a complete failure. It is equally apparent that martens have not thrived on Afognak Island like they have on some islands in Southeastern Alaska.

Mink Transplants

There have been only three reported transplants, or more properly stockings, of mink in Alaska. After several unsuccessful attempts to purchase live-caught, wild mink from the Cordova area, officials of the Alaska Game Commission and U. S. Fish and Wildlife Service agreed that fur farm reared mink should be used in their transplants. As a result 24 mink (16 females and 8 males) from the Petersburg Fur Experiment Farm were released December 20, 1951, on Montague Island in Prince William Sound (Nelson, 1951a). Although this introduction resulted in harvestable mink populations, local trappers report that pelt quality is poor and they do not bring a satisfactory price.

Mink from the Petersburg Fur Experiment Farm were also used in a transplant to Karluk Lake on Kodiak Island. On October 28, 1952, 16 females and eight males were released at this site (Nelson, 1952b). Mink sign was seen around Karluk Lake for two or three years following this transplant, but it now appears that this attempt failed.

In 1956, ten mink (six females and four males) from the Experiment Farm were released on Strait Island in Southeastern Alaska (Nelson, 1957). Results of this transplant are unknown.

Sea Otter Transplants

Within the past two decades many attempts have been made to reestablish sea otters on their former ranges in Alaska and elsewhere (Fig. 4). A vast amount of effort has been expended in developing techniques and actually moving otters from well-established populations in the Aleutian Islands to habitats formerly occupied by this species. Initial efforts in the mid 1950's by personnel of the Fish and Wildlife Service resulted in the introduction of 26 sea otters from Amchitka Island to St. Paul and Otter Islands in the Pribilof Island group and the movement of five Amchitka otters to Attu Island (Kenyon and Spencer, 1960). The Pribilof transplant apparently was a success.

After statehood the Alaska Department of Fish and Game undertook extensive sea otter transplants in cooperation with the Atomic Energy Commission (Table 3). Improvements were made in capture techniques and better systems were developed for holding animals on Amchitka Island and transplanting animals with aircraft. Transplants in 1966 resulted in the movement of 10 otters to Yakutat Bay and 20 otters to Khaz Bay near Sitka (Schneider, 1973). A series of transplants in 1968 resulted in the introduction of 359 sea otters to former ranges throughout the state (Table 3). In 1969 Khaz Bay received an additional 58 otters bringing its total of transplanted animals to 194.

Also in 1969 efforts were extended to repopulate former sea otter ranges south of Alaska (Schneider, 1973). That year British Columbia received 29 otters which were introduced into coastal waters near Vancouver Island. At the same time Washington State accepted a shipment of 29 otters to be transplanted into coastal waters off the Olympic Peninsula. Unfortunately 13 of these 29 sea otters died shortly after being transplanted, apparently as a result of shock.

Efforts to expand sea otter populations outside Alaska continued in 1970 with British Columbia, Washington and Oregon receiving 14, 30 and 29 animals, respectively. Oregon was the recipient of an additional 63 sea otters in 1971 and British Columbia received 46 more animals in 1972. The 60 otters for the 1970 and 1972 transplants to British Columbia were captured in Prince William Sound near Montague and Green Islands. All otters for Washington and Oregon and the 29 otters transported to British Columbia in 1969 were taken near Amchitka Island.

It appears now that sea otter populations have been established in the Pribilof Islands as a result of the 1968 release of 57 otters by the Alaska Department of Fish and Game, natural movement of otters from the Alaska Peninsula or the U. S. Fish and Wildlife Service transplants of the mid 1950's (Schneider, 1973). A number of sightings of up to 15 sea otters in Yakutat Bay in recent years provide some evidence that the 1966 transplant of 10 otters has resulted in at least a small population in that area. As a result of the transplant of 403 otters between 1965 and 1969 in the areas from Cape Spencer to Dixon Entrance in Southeastern Alaska two major populations of sea otters have become established (Schneider, 1973). These two major concentrations, showing high reproductive rates, are located on the west sides of Chichagof and Yakobi Islands. Lesser numbers of sea otters are periodically sighted along the entire coast south to the Necker Islands and in several areas west of Prince of Wales Island. An occasional individual is seen in the inside waters of the Alexander Archipelago.

The ultimate results of efforts to reestablish sea otters to the waters of Oregon, Washington and British Columbia probably will not be known for many years. It appears now, however, that at least the animals in Oregon and British Columbia waters are faring well. In Oregon it appeared that by 1973 the otters had consolidated into a single group and were reproducing (Howard Wight, Oregon Coop. Wildl. Res. Unit, pers. comm.).

Fig. 4. *After an absence of over half a century sea otters again reside in waters of Southeastern Alaska, British Columbia, Washington and Oregon thanks to recent transplants by the Alaska Department of Fish and Game (photo by E. G. Klinkhart).*

Table 3. Numbers of sea otters transplanted in Alaska, 1955-1972 (from Schneider, 1973).

Release Site	1955	1956	1959	1965	1966	1968	1969	1970	1971	1972	Total
Aleutians											
Attu Is.		5									5
Pribilofs											
Otter Is.	19[1]										19
St. Paul Is.			7								7
St. George Is.						57					57
Southeast Alaska											
Yakutat Bay					10						10
Khaz Bay (Chichagof Is.)				23	20	93	58				194
Yakobi Is.						30					30
Biorka Is.						48					48
Barrier Is.						55					55
Heceta Is.						51					51
Cape Spencer						25					25
British Columbia											
Vancouver Is.							29	14		46	89
Washington							29[2]	30			59
Oregon								29	63		92
Total	19	5	7	23	30	359	116	73	63	46	741

[1]None believed to have survived.
[2]At least 13 died shortly after release.

NOTE: 1955 to 1959 by USF&WS (31 sea otters), 1965 to 1962 (710 sea otters) by ADF&G. In some cases one or two of the above animals died near the time of release.

Raccoon Transplants

Releases of raccoons *(Procyon lotor)* have been made by private individuals in several locations within Alaska. With the exception of several introductions onto islands in Southeastern, these transplants have apparently been unsuccessful.

A few raccoons have been released in the Fairbanks area; apparently these were pets that either escaped or were released for other reasons. One such animal survived through a winter in the vicinity of the Fairbanks Municipal Dump only to be taken by a trapper the following winter (Robert Rausch, ADF&G, pers. comm.). Another raccoon was trapped the next year near Fairbanks.

Long Island, near Kodiak, was the site of another raccoon transplant (Murie and Scheffer, 1959). Fur farmers imported these animals from several Midwestern states sometime prior to 1936. Although a few remained at that time they eventually died out completely. Two transplants of raccoons in Southeastern Alaska apparently have resulted in viable populations of this species. In 1941 a private individual placed eight raccoons from Indiana on Singa Island in El Capitan Passage off the west coast of Prince of Wales Island (Elkins and Nelson, 1954). In terms of establishing a raccoon population this transplant was successful and this species now occupies Singa, El Capitan, and several other islands in this area.

The last known introduction of raccoons occurred in 1950 when an unknown number of animals were released or escaped on Japonski Island near Sitka (Elkins and Nelson, 1954). This introduction, like that on Singa Island, resulted in a viable population of raccoons that has spread to nearby Baranof Island. Raccoon transplants, although technically considered successful, should not be termed desirable. The impact of this introduced species on native furbearers and populations of ground nesting birds is not known and it may be that raccoons will prove detrimental to native fauna. It is known that the poor market for raccoon pelts has resulted in little utilization of this resource.

Red Squirrel Transplants

Red squirrels *(Tamiasciurus hudsonicus)* were often introduced as a food source for transplanted martens, even though several studies in Alaska and elsewhere have shown that squirrels do not necessarily comprise a significant portion of a marten's diet (Lensink et al., 1955). It is not likely that red squirrel transplants have greatly influenced the outcome of marten introductions. On Afognak Island, for example, red squirrels are abundant but martens are not. Admiralty Island supports a large natural marten population but red squirrels are scarce or nonexistent.

In 1930 Baranof Island received a transplant of 55 red squirrels live-trapped in the Juneau area (Alaska Game Commission, 1931). The same year 50 squirrels from Juneau were transported to Basket Bay (25 animals) and Whitestone Harbor (25 animals) on Chichagof Island. Introductions to Chichagof Island were bolstered in 1931 when 40 more squirrels from the Juneau area were released at Patterson Bay (Alaska Game Commission, 1935).

A red squirrel transplant consisting of 47 animals captured in the Anchorage area was conducted in July and August 1952 to Afognak Island a few months prior to the marten transplant on that island (Nelson, 1952a). This transplant resulted in excellent squirrel populations but apparently did little to affect the ultimate success of the marten introduction. Also in 1952, 24 squirrels from the Anchorage area were released on Cape Chiniak, Kodiak Island (Nelson, 1952a). This introduction was not successful in establishing a red squirrel population.

Marmot Transplant

The Alaska Game Commission, apparently with the objective of establishing a harvestable fur resource, transplanted marmots *(Marmota caligata)* to Prince of Wales Island in 1930 and 1931. On August 26, 1930, three marmots trapped in the Juneau area were released near Klawock and in September 1931 five pairs from the same source were released on the west coast of Prince of Wales Island (Alaska Game Commission, 1935). The present status of this marmot population is unknown.

Ground Squirrel Transplants

Ground squirrels *(Spermophilus undulatus)* from mainland sources were transplanted to Unalaska Island in the Aleutian Chain in 1896 or 1897 (Murie and Scheffer, 1959). In 1920 some of these squirrels were transported to Kavalga Island where they subsequently increased in number. The objectives of these transplants are unknown, but probably they were implemented in order to provide a food source for foxes.

Wolf Transplant

Four wolves *(Canis lupus)* approximately 19 months old (two males and two females) were released on October 27, 1960, at Coronation Island in Southeastern Alaska by personnel of the Alaska Department of Fish and Game (Merriam, 1964). An additional female was released there in April 1963. The goal of this transplant was "to determine the impact of wolves on a deer population which previously had not been subjected to predation." By 1964 these wolves had increased greatly (to about 12 animals) and were having an obvious influence on this deer population (Merriam, 1964). By 1970, however, natural mortality had completely decimated this isolated wolf population (H. Merriam, ADF&G, pers. comm.).

Hare and Rabbit Transplants

Numerous releases of hares and rabbits have been made in a variety of locations throughout Alaska (Table 4). Although most of these transplants were failures, several have produced harvestable populations.

The first successful transplant was conducted in 1934 under the direction of the Alaska Game Commission (Elkins and Nelson, 1954). A total of 558 snowshoe hares *(Lepus americanus)*, captured along the Alaska Railroad near Anchorage, were released on Kodiak and Afognak Islands. This transplant was very successful, and in 1952 hares from Kodiak Island were captured and introduced to the adjacent Woody and Long Islands (Elkins and Nelson, 1954). These introductions were also successful.

In 1955 snowshoe hares were again taken from Kodiak Island, this time for introduction to Popof Island in the Shumagin Island group (Nelson, 1955a). This operation was conducted by personnel of the Kodiak National Wildlife Refuge, and although the release consisted of only 15 hares a substantial population had developed as early as 1960.

Several European rabbit introductions have been successfully accomplished in Alaska by the release and establishment of domestic rabbits (Table 4). One such release occurred at Nikolski Village on Umnak Island in the Aleutian Chain about 1930 (Arthur J. Harris, resident of Nikolski, pers. comm.). Mr. Harris also stated that about 1940 rabbits from Umnak Island were placed on an adjacent small island, now commonly called Rabbit Island. Rabbits also occur on Hog Island near Amaknak Island in Unalaska Bay (Robert D. Jones, Aleutian Islands Natl. Wildl. Refuge, pers. comm.).

Table 4. Releases of snowshoe hare and European rabbit in Alaska.

Area of Release	Date	Number of Animals Released	Source of Animals	Population Status*
Snowshoe Hare				
Smeaton Island (Behm Canal)	1923	18	Washington	5
Admiralty Island, Pt. Retreat (Barlow Islands)	1924	20	Washington	5
Otstoia Island (Peril Strait)	1924	20	Washington	5
Cape Island (Prince of Wales)	1924	24	Anchorage	5
Village Island (Zimovia Strait)	1924	20	Anchorage	5
Kodiak & Afognak Islands	1934	558	Anchorage	1
Woody Island (Kodiak)	1952	12	Kodiak Island	1
Long Island (Kodiak)	1952	6	Kodiak Island	1
Popof Island (Shumagin Island)	1955	15	Kodiak Island	1
European Rabbit				
Umnak Island (Aleutian Islands)	1930**	Unknown	Domestic	1
Rabbit Island (Aliutian Islands)	1940**	Unknown	Umnak Island	1
Hog Island (near Amuknak Island, Aleutian Islands)	Unknown	Unknown	Unknown	1
Middleton Island (Gulf of Alaska)	1954	3 females, 1 male	Domestic	1

* 1-Harvestable population
2-Small population, probably increasing
3-Small population, no significant harvest
4-A few animals may persist
5-No animals remaining
6-Unknown

** Approximate date.

Middleton Island, in Prince William Sound, received a transplant of domestic rabbits (three females and one male) in 1954 (O'Farrel, 1965). These rabbits, which were kept as semidomestic pets under the houses of island residents, had increased to 50 by the fall of 1955 and to approximately 200 by the summer of 1956. Fluctuations in numbers of major magnitude have occurred since then, and a noticeable die-off occurred in February 1961 when the population numbered some 3,600 to 7,000 animals (O'Farrel, 1965). Estimates made in the summer of 1962 placed the population at about 5,000 rabbits but it dropped to about 3,000 animals during the 1962-63 winter.

Several transplants of hares and rabbits attempted in Southeastern Alaska apparently were unsuccessful.

GAME BIRDS

In spite of numerous attempts to transplant various exotic game bird species into Alaska and several attempted range extensions of native birds to other areas in the state, there have been no successful game bird transplants to date. This is contrary to the history of game transplants on the North American continent, where the introductions of such exotic species as the ring-necked pheasant, and chukar *(Alectoris graeca)* and gray *(Perdix perdix)* partridges have highlighted successful transplants.

Pheasant and Chukar Partridge Transplants

Although the Alaska Game Commission reported in March 1931 that "private and cooperative enterprises have resulted in the establishment of small colonies of wild Chinese or ring-necked pheasants in the vicinity of Juneau and Sitka," the earliest documented game bird transplant was in 1934. That year 225 ring-necked pheasants from Washington State were released at Sitka and Goddard Hot Springs on Baranof Island (Elkins and Nelson, 1954). This attempted introduction of pheasants and many others throughout the state from 1934 to 1942 were outstanding examples of failure (Table 5).

Between 1942 and 1957 there was only one recorded game bird transplant in Alaska, an unsuccessful attempt by a private citizen to introduce pheasants to the Fairbanks area (Burris, personal files). Other releases of pheasants have been made from time to time by private individuals. Birds from these attempted introductions are occasionally seen and stimulate further transplants of pheasants. The inability of pheasants to survive in Alaska has been clearly illustrated by transplants in the Matanuska Valley, however. Following one such effort in 1938, transplanted ringnecks increased for several successive favorable years and were still being seen in the mid 1950's (Weeden, 1965). After one or two severe winters few pheasants could be located in the valley and interest in stocking them diminished.

The unsuitable Alaskan climate did much to quash interest of the citizenry in pheasant transplants, and government transplant programs during the 1950's also digressed from game bird introductions. In 1950, Clarence J. Rhode, Regional Director of the U. S. Fish and Wildlife Service, established five priorities for game animal transplants. Introductions of exotic game birds were assigned the lowest priority and pheasant transplants ceased.

Only one attempt has been made to establish chukar partridges in Alaska. In 1938, 17 adult chukars were released in the Matanuska Valley. It is doubtful that they ever reproduced and by 1943 all had died (Elkins and Nelson, 1954).

Native Game Bird Transplants

Although introductions of exotic game birds were given low priority by the U. S. Fish and Wildlife Service in 1950, several transplants of a native species, the spruce grouse *(Canachites canadensis)*, were attempted by this agency (Table 6). These transplants, to Kodiak Island in 1957 and 1959, were made from grouse captured on the Kenai Peninsula and were unsuccessful (Weeden, 1965).

Because enthusiasm for the establishment of another game bird on Kodiak Island existed after statehood, the Alaska Department of Fish and Game attempted to introduce blue grouse *(Dendragapus obscurus)* there in 1962, 1963 and 1964 (Weeden, 1965). It appears now that this introduction failed like all previous attempts.

Table 5. Pheasant transplants in Alaska (from Executive Officer's report to the Alaska Game Commission, Jan. 1, 1943 to Nov. 3, 1943).

Area of Release	Variety	Date	Number of Birds Released	Source of Birds	Population Status*
Juneau	Chinese or Ring-necked	1930	Unknown	Unknown	5
Sitka	Chinese or Ring-necked	Prior to 1931	Unknown	Unknown	5
Baranof Island Goddard Hot Springs and Sitka	Ring-necked	1934	225	Washington	5
Ketchikan	Ring-necked	1936	100	Washington	5
Cordova	Ring-necked	1936	Unknown	Washington	5
Matanuska Valley	Ring-necked	1938	Unknown	Unknown	5
Fairbanks	Unknown	1936	Unknown	Unknown	
	Unknown	1952	Unknown	Unknown	5
Matanuska Valley	Mongolian	1938	500	Wisconsin	5
Ketchikan	Mongolian	1939	12	Washington	5
Petersburg	Mongolian	1939	75	Washington	5
	Mongolian	1940	60	Washington	5
	Brown-eared	1940	12	Wisconsin	5
	Nepal, Kaleege	1941	12	Wisconsin	5
Kenai Lake	Mongolian	1940	87	Washington	5
Cooper Landing	Reeves	1940-42	50	Wisconsin	5
	Cheer	1940	4	Wisconsin	5
Wrangell	Mongolian	1940	100**	Unknown	5
	Mongolian	1940	32	Washington	5
Haines	Mongolian	1942	46	Washington	5

* 1-Harvestable population
2-Small population, probably increasing
3-Small population, no significant harvest
4-A few birds may persist
5-No birds remaining
6-Unknown

** There may be some type of duplication involved in this release as the available records do not correspond.

Table 6. Miscellaneous game bird transplants in Alaska.

Area of Release	Date	Number of Game Birds Released	Source of Game Birds	Population Status*
Chukar Partridge				
Matanuska Valley	1938	17	Wisconsin	1
Spruce Grouse				
Kodiak Area	1957 and 1959	31	Kenai Peninsula	1
Blue Grouse				
Kodiak Area	1962	30	S.E. Alaska	2
Chiniak Pen.	1963 and 1964			

* 1-No animals remaining.
2-Unknown.

SUMMARY

From the time of its earliest occupation by the white man, Alaska has been an example of man's ability to alter the natural fauna. Alaska's many islands and lands only recently exposed by receding glaciers have offered an abundance of unfilled ecological niches which man has displayed an obsession to fill. Because the majority of game transplants attempted have been made to areas previously lacking similar endemic species, a large proportion of these attempts have resulted in viable populations of the introduced species.

Results of many of these transplants are difficult to assess. In a few instances the introduction of only a few animals resulted in tremendous rewards in the form of food and recreational opportunities for the citizens of the state. Nevertheless, the vast majority of these transplants have made no practical contribution to mankind and some have even been detrimental.

Introductions of Sitka black-tailed deer to Kodiak Island and the Prince William Sound area must be considered outstanding successes. The Berners Bay and Copper River moose transplants are other examples of successful introductions of an endemic big game species into new areas. Many other transplants of big game have resulted in only limited populations capable of sustaining insignificant harvests. Still others have failed completely.

Furbearer transplants, although popular in concept and attempted often, have essentially failed to provide any practical benefits. Even on Kodiak Island, where introduced beaver populations have sustained a substantial harvest, benefits accrued may be offset by adverse effects on salmon spawning. Marten introductions to Prince of Wales, Baranof and Chichagof Islands are potentially beneficial, if reasonable utilization were made of these populations. Recent reestablishment of sea otter populations in former ranges will provide little economic benefit to mankind but from an aesthetic viewpoint must be considered to have accrued desirable results. Numerous fox introductions in the Aleutian Islands were far more detrimental than beneficial; populations of ground nesting birds have been severely reduced, some species nearly to the point of extinction, as a result of fox predation.

Although several hare and rabbit transplants have resulted in huntable populations, utilization is too slight to consider these ventures unqualified successes. Game bird transplants, on the other hand, can only be judged absolute failures and a waste of effort and money.

Because the recreational potential of many of Alaska's native game animals is still essentially untapped, transplants intended to provide additional recreation opportunity hardly seem valid. Man's compelling desire to undo the wrongs of the past and to correct nature's errors or oversights may provide impetus to reestablish locally extirpated populations or to move an endemic species into heretofore unoccupied ranges, however. Recently accomplished transplants of caribou onto the Kenai Peninsula, muskoxen onto the Alaska mainland and sea otters to Southeastern waters typify this type of transplant.

Possibilities always exist that transplants will be conducted in deference to influential groups or individuals without regard to the merits or disadvantages of such an introduction. History is replete with the potential dangers of such ill-advised activities, however, and the safeguards against such introductions appear adequate at present. Necessary review by Department biologists and federal authorities responsible for the welfare of our wildlife resources should minimize or alleviate these problems.

As previously mentioned, insular situations in Alaska once afforded many possibilities for potentially beneficial and successful transplants of endemic species. Because obvious opportunities of such a nature have already been exploited, the risk of failures has increased. Possibilities for introducing exotic species into Alaska have not diminished. Because it is difficult or even impossible to predict the impact of an exotic species on our native fauna and flora, however, such transplants must be evaluated very carefully and attempted only if their potential benefits outweigh possible undesirable effects.

LITERATURE CITED

Alaska Game Commission. Annual Reports - 1925 to 1937. Juneau. Mimeo.

_____. 1952. Investigation to determine practicability of reestablishing caribou on the Kenai Peninsula. Fed. Aid in Wildl. Rest. Quarterly Rept. 7(2):60-63.

Alexander, J. E. 1973. Seasonal movements of elk. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Final Report. 37 pp.

_____., W. H. Griffin and H. Wood. 1968. Elk and Goat, Bison and Muskox. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Prog. Rept. Project W-15-R-2, Juneau.

Allen, D. L. 1954. Our wildlife legacy. Funk and Wagnalls Co., New York. 422 pp.

Batchelor, R. F. 1965. The Roosevelt elk in Alaska - its ecology and management. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Final Report. 37 pp.

_____. and H. R. Merriam. 1963. Game introductions. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Prog. Rept. Project W-6-R-4, Juneau.

Burris, O. E. 1964. Alaska wildlife stocking. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Prog. Rept. Project W-11-D-1, Juneau.

_____. 1965. Game transplants in Alaska. Proc. 45th Conf. West. Assoc. of State Fish and Game Comm. pp. 93-104.

Eide, S. E., W. H. Griffin and H. Wood. 1967. Elk and Goat, Bison and Muskox. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Prog. Rept. Project W-15-R-1, Juneau.

Elkins, W. A. and U. C. Nelson. 1954. Wildlife introductions and transplants in Alaska. Proc. 5th Alaska Science Conf. 21 pp. (mimeo)

Glenn, L. P. 1967. Caribou report. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Prog. Rept. Project W-15-R-1 & 2, Juneau.

Griffin, W. H. and J. E. Alexander. 1969. Bison and elk studies. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Prog. Rept. Projects W-13-R-3 and W-17-1, Juneau.

Heinming, J. E. 1971. The distribution and movement patterns of caribou in Alaska. Alaska Department of Fish and Game, Game Tech. Bull. No. 1. 60 pp.

Jennings, L. B. 1969. Muskox report. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Prog. Rept. Project W-15-R-3, Juneau.

_____. 1970. Muskox transplant. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Prog. Rept. Project W-17-1, Juneau.

_____. and O. E. Burris. 1971. Muskox report. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Prog. Rept. Project W-17-2, Juneau.

Jones, F. F. and H. R. Merriam. 1963. Sheep and goat report. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Prog. Rept. Project W-6-R-4, Juneau.

Jones, R. D. 1966. Raising caribou for an Aleutian introduction. J. Wildl. Mgmt. 30(3):453-460.

Kenyon, K. W. and D. L. Spencer. 1960. Sea otter population and transplant studies in Alaska, 1959. U. S. Fish and Wildl. Ser., Spec. Scientific Rept. - Wildl. No. 48. 29 pp.

Klein, D. R. 1967. The introduction, increase, and crash of reindeer on St. Matthew Island. J. Wildl. Mgmt. 32(2):350-367.

Lensink, C. J., R. O. Skoog and J. L. Buckley. 1955. Food habits of marten in Interior Alaska and their significance. J. Wildl. Mgmt. 19(3):364-368.

Lentfer, J. W. 1965. Caribou report. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Prog. Rept. Project W-6-R-5 and 6, Juneau.

Leopold, A. S. and F. F. Darling. 1953. Effects of land use on moose and caribou in Alaska. Trans. N. Amer. Wildl. Conf. 553-562.

Merriam, H. R. 1960. Moose investigations, Southeast Alaska. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Prog. Rept. Project W-6-R-1, Juneau.

_____. 1964. The wolves of Coronation Island. Proc. 15th Alaskan Sci. Conf., College. pp. 27-32.

Murie, O. J. and V. B. Scheffer. 1959. Fauna of the Aleutian Islands and Alaska Peninsula. No. Am. Fauna No. 61. U. S. Fish and Wildl. Service, Washington, D. C.

Nelson, U. C. 1950. Quarterly progress report - surveys and investigations. Fed. Aid in Wildl. Rest. Proj. 3-R-5, Alaska. Vol. 5, No. 1.

_____. 1951a. Stocking mink on Montague Island. Fed. Aid in Wildl. Rest. Proj. W-D-2, Alaska. Completion Report.

_____. 1951b. Quarterly progress report - development. Fed. Aid in Wildl. Rest. Project W-4-D-2, Alaska. Vol. II, No. 1.

_____. 1952a. Quarterly progress report - development. Fed. Aid in Wildl. Rest. Project W-4-D-3, Alaska. Vol. III, No. 1.

_____. 1952b. Quarterly progress report - development. Fed. Aid in Wildl. Rest. Project W-4-D-3, Alaska. Vol. III, No. 2.

_____. 1953. Stocking Mt. Goat, Kodiak Island, Alaska. Fed. Aid in Wildl. Rest. Projects 3-R and 4D, Alaska. Completion Report.

_____. 1954. Quarterly progress report - development. Fed. Aid in Wildl. Rest. Project W-4-D-5, Alaska. Vol. V, No. 1 & 2.

_____. 1955a. Quarterly progress report - development. Fed. Aid in Wildl. Rest. Project W-4-D-5, Alaska. Vol. V, No. 3 & 4.

_____. 1955b. Quarterly progress report - development. Fed. Aid in Wildl. Rest. Project W-4-D-6, Alaska. Vol. VI, No. 1 & 2.

_____. 1957. Quarterly progress report - development. Fed. Aid in Wild. Rest. Project W-4-D-7. Vol. VII, No. 1-4.

_____. 1958. Progress report - development. Fed. Aid in Wildl. Rest. Project W-4-D-8. Vol. VIII, No. 1-4.

_____. 1959. Completion report - development. Fed. Aid in Wildl. Rest. Project W-4-D-9. Vol. IX, No. 1-4.

Nichols, L. 1968. Dall sheep report. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Prog. Rept. Project W-15-R-2 and 3, Juneau.

O'Farrel, T. P. 1965. The rabbits of Middleton Island, Alaska. Jour. Mamm. 46(3):525-527.

Palmer, L. J. 1935. Letter to chief, Biol. Survey. Washington, D. C.

_____. and C. H. Rouse. 1963. Progress of muskoxen investigations in Alaska 1930-1935. Bureau of Sport Fisheries and Wildlife, Juneau. 25 pp. (mimeo)

Preble, E. A. and W. L. McAtee. 1923. A biological survey of the Pribilof Islands, Alaska. North Am. Fauna No. 46. U. S. Biological Survey, Washington, D. C.

Rausch, R. A. 1958. Memo to chief, Division of Fish and Game Restoration. Bureau of Sport Fisheries and Wildlife, Juneau.

Robards, F. 1953. Annual game report. Typewritten.

Schneider, K. B. 1973. Sea otter distribution and abundance in Alaska. Unpublished report (processed). Alaska Dept. of Fish and Game files. 5 pp. & maps.

Spencer, D. L. and J. B. Hakala. 1964. Moose and fire on the Kenai. Proc. Tall Timbers Fire Ecology Conf. 3:11-33.

_____. and C. J. Lensink. 1970. The muskox of Nunivak Island, Alaska. Jour. Wildl. Mgmt. 34(1):1-15.

Weeden, R. B. 1965. Grouse and ptarmigan in Alaska - their ecology and management. Alaska Dept. of Fish and Game, Fed. Aid in Wildl. Rest. Project Report. Project W-6-R-5, Juneau.

APPENDIX I

Alaska Statutes, Chapter 25, Stocking of Public Lands. (Originally enacted in 1925).

Chapter 25. Stocking of Public Lands.

Sec. 16.25.010. Program adopted. There is adopted a program of stocking lands in the state with valuable game and fur-bearing animals which do not at present occur on these lands. (sec. 39-7-1 ACLA 1949)

Sec. 16.25.020. Projects enumerated. The stocking program is divided into the following projects:

(1) Roosevelt elk to Kenai Peninsula, Hinchinbrook and Kruzof Islands, and the Kodiak-Afognak Island group;
(2) elk to Copper River Valley region;
(3) muskrats to Kodiak-Afognak group;
(4) beaver to Baranof and Chichagof Islands;
(5) beaver to Afognak and northeast portion of Kodiak;
(6) deer to Afognak-Kodiak Island group;
(7) spruce hens, arctic hare, snowshoe rabbits, mountain sheep, mountain goat and caribou to Kodiak-Afognak Island group;
(8) marten to Prince of Wales Island group, and to Zarembo Island;
(9) marten to Prince William Sound Islands;
(10) beaver to Yakutat Coastal Plain Region, including Lituya Bay;
(11) marten to Afognak and northeast portion of Kodiak Island;
(12) muskrats to portions of southeastern Alaska and Seward Peninsula;
(13) beaver to Chilkat Valley;
(14) varying hares to southeastern Alaska;
(15) moose to Kodiak-Afognak Island group;
(16) beaver to Zarembo Island;
(17) varying hares to Kodiak-Afognak Island group;
(18) marten to Baranof and Chichagof Islands;
(19) red squirrels to Zarembo, Admiralty, Baranof, and Chichagof Islands, and to the Prince of Wales Island group, including Sitka Park;
(20) red squirrels to Afognak and northeast portion of Kodiak group;
(21) varying hares to Prince William Sound Islands;
(22) mountain goats to Prince William Sound Islands;
(23) mountain goats to southeastern Alaska Islands;
(24) elk and deer from interior North America to the Tanana Valley;
(25) mink to St. Lawrence Island;
(26) buffalo to interior Alaska;
(27) marmot to Prince of Wales Island;
(28) Siberian blue squirrel to Seward Peninsula;

(29) reindeer to Unalaska Island;
(30) blue grouse to Prince of Wales Island;
(31) reindeer, between Yukon and Kuskokwim Deltas, commonly known as Hooper Bay-Nelson Island District;
(32) Chinese, ring-neck or Mongolian pheasants to Baranof or Kruzof Islands. (sec. 39-7-1 ACLA 1949)

Sec. 16.25.030. Department to carry out program. The department shall carry out the projects set forth in secs. 10 and 20 of this chapter by obtaining the animals and placing them on the lands designated. At least one project shall be undertaken in each division every two years. The department shall establish the priority of the projects. (sec. 39-7-2 ACLA 1949)

Sec. 16.25.040. Stock and offspring property of state. When the state stocks lands with game animals, game birds or fur bearing animals, they and their offspring are the property of the state until the governor, by public proclamation, declares that they are public property. (sec. 39-7-3 ACLA 1949)

Sec. 16.25.050. Unlawful taking. It is unlawful to willfully take, attempt to take, catch, kill, or possess a stocked animal or offspring. (sec. 39-7-3 ACLA 1949)

Sec. 16.25.060. Penalty for violation of sec. 50 of this chapter. A person violating sec. 50 of this chapter is guilty of a misdemeanor, and upon conviction is punishable by a fine of not more than $250, or by imprisonment for not more than six months, or by both. (sec. 39-7-4 ACLA 1949)

APPENDIX II

Summary of Game Transplants in Alaska

Species	Date(s)	Transplant Site	Source of Stock	Population Status
		BIG GAME		
Black-tailed deer	1916 and 1917 through 1923	Hinchinbrook and Hawkins Islands, Prince William Sound	Sitka area	Harvestable population
	1923	Homer Spit, Kenai Peninsula	Sitka area	No animals remaining
	1924 and 1930	Long Island, Kodiak Island group	Sitka area and Prince of Wales Island	Harvestable population
	1934	Kodiak Island	Petersburg area	Harvestable population
	1934	Islands in Yakutat Bay	Petersburg area	Harvestable population
	1951, 1952 and 1956	Taiya Valley, Skagway	Southeastern Alaska	A few animals may persist
	1951-1954	Sullivan Island, Lynn Canal	Southeastern Alaska	Small population - no significant harvest
Moose	1949-1958	Copper River Delta, Prince William Sound	Southcentral Alaska	Harvestable population
	1958 and 1960	Berners Bay	Southcentral Alaska	Harvestable population

Appendix II. (cont'd.) Summary of game transplants in Alaska.

Species	Date(s)	Transplant Site	Source of Stock	Population Status
	1957, 1958 and 1959	Kalgin Island, Cook Inlet	Southcentral Alaska	A few animals may persist
	1963 and 1964	Chickamin River	Southcentral Alaska	A few animals may persist
	1966 and 1967	Kodiak Island	Southcentral Alaska	No animals remaining
Muskox	1935 and 1936	Nunivak Island	Greenland	Harvestable population
	1967 and 1968	Nelson Island	Nunivak Island	Harvestable population
	1969 and 1970	North Slope of the Brooks Range	Nunivak Island	Small population - probably increasing
	1970	Feather River, Seward Peninsula	Nunivak Island	Small population - probably increasing
	1970	Cape Thompson	Nunivak Island	Small population - probably increasing
Bison	1928 and 1930	Delta	Montana	Harvestable population
	1950	Copper River	Delta herd	Harvestable population
	1962	Chitina	Delta herd	Small population - no harvest

Appendix II. (cont'd.) Summary of game transplants in Alaska.

Species	Date(s)	Transplant Site	Source of Stock	Population Status
	1965 and 1968	Farewell	Delta herd	Harvestable population
Elk	1926 and 1928	Kruzof Island	Washington State	No animals remaining
	1929	Afognak Island	Washington State	Harvestable population
	1937	Revillagigedo Island	Washington State	No animals remaining
	1962	Gravina Island	Afognak and Raspberry Islands	No animals remaining
	1963 and 1964	Revillagigedo Island	Afognak Island	A few animals may persist
Caribou	1958 and 1959	Adak Island	Nelchina herd, Southcentral Alaska	Harvestable population
	1965 and 1966	Kenai Peninsula	Nelchina herd, Southcentral Alaska	Harvestable population
Mountain goat	1923	Baranof Island	Tracy Arm, Southeast Alaska	Harvestable population
	1952 and 1953	Kodiak Island	Kenai Peninsula	Harvestable population
	1953-1955	Chichagof Island	Various places throughout Alaska	Unknown

Appendix II. (cont'd.) Summary of game transplants in Alaska.

Species	Date(s)	Transplant Site	Source of Stock	Population Status
Dall sheep	1964, 1965 and 1967	Kodiak Island	Kenai Peninsula	Unknown
		FURBEARERS		
Foxes	(see Table 2, page 31)			
Muskrat	1913	Pribilof Islands	Nushagak area	No animals remaining
	1925	Kodiak Archipelago	Copper River	Harvestable population
	1929	Kodiak and Afognak Islands	Long Island, near Kodiak Island	Harvestable population
	1929	Prince of Wales Island	Haines area	No animals remaining
Beaver	1925	Kodiak Island	Copper River Delta	Harvestable population
	1927	Baranof Island	Prince of Wales Island	Small population - no significant harvest
	1929	Raspberry Island, near Kodiak Island	Copper River Delta	Harvestable population
Marten	1934	Prince of Wales Island	Behm Canal, near Ketchikan	Harvestable population

Appendix II. (cont'd.) Summary of game transplants in Alaska.

Species	Date(s)	Transplant Site	Source of Stock	Population Status
	1934	Baranof Island	Thomas Bay, near Petersburg	Harvestable population
	1949, 1951 and 1952	Chichagof Island	Southeastern Alaska	Harvestable population
	1952	Afognak Island	Lake Minchumina, Interior Alaska	Small population - no significant harvest
Mink	1951	Montague Island, Prince William Sound	Petersburg Fur Farm	Harvestable population
	1952	Kodiak Island	Petersburg Fur Farm	No animals remaining
	1956	Strait Island Southeast Alaska	Petersburg Fur Farm	Unknown
Sea otter	(see Table 3, page 37)			
Raccoon	Prior to 1936	Long Island, Kodiak Island group	Midwestern states	No animals remaining
	1941	Singa Island, near Prince of Wales Island	Indiana	Harvestable population
	1950	Japonski Island, near Sitka	Unknown	Harvestable population
Red squirrel	1930	Baranof Island	Juneau area	Harvestable population

Appendix II. (cont'd.) Summary of game transplants in Alaska

Species	Date(s)	Transplant Site	Source of Stock	Population Status
	1930 and 1931	Chichagof Island	Juneau area	Harvestable population
	1952	Afognak Island	Anchorage area	Harvestable population
	1952	Kodiak Island	Anchorage area	No animals remaining
Marmot	1930 and 1931	Prince of Wales Island	Juneau area	Unknown
Ground squirrel	1896 or 1897	Unalaska Island	Alaska mainland	Harvestable populations
	1920	Kavalga Island	Unalaska Island	Harvestable populations
Wolf	1960 and 1963	Coronation Island	Southeast Alaska	No animals remaining
		SMALL GAME		
Hares and rabbits	(see Table 4, page 40)			
		GAME BIRDS		
Pheasants	(see Table 5, page 43)			
Chukar and native game birds	(see Table 6, page 44)			