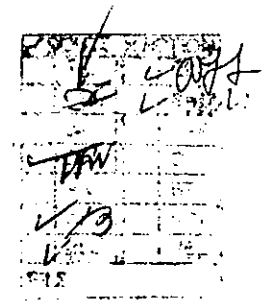

Post Compound 1080 Wildlife Surveys, Kiska Island, Aleutian Islands, Alaska - 25 March-30 March 1987 (In Support of EPA Experimental Use Permit 6704-EUP-28)

by

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and

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CITATION

OBJECTIVE To survey the target and non-target mammal and bird species of Kiska Island and monitor the affect of the Compound 1080 treatment on the respective species. The project was conducted to evaluate Compound 1080 as a potential introduced fox eradication tool on Kiska and perhaps other select islands within the Aleutian Islands Unit of the Alaska Maritime National Wildlife Refuge.

METHOD OF STUDY Three arctic fox surveys on 8 established fox transects, 3 northern sea lion surveys and 3 island-wide raptor surveys were completed over Kiska Island via a Bell 412 helicopter. Ground searches for arctic fox were conducted at Kiska Harbor, Lief Cove and on the southwest end of Kiska.

MAIN FINDINGS No fox or fox sign was observed during any of the three aerial fox surveys or the ground searches conducted at Kiska Harbor, Lief Cove and at the southwest end of Kiska. Also, no fox or fox sign was observed incidentally during the northern sea lion or raptor surveys. A mean of 38 adult bald eagles, 44 total eagles and 7 peregrine falcons were recorded during the 3 island-wide surveys of Kiska. A total of 15 bald eagle aeries were recorded on Kiska. A mean of 1,765 northern sea lions were recorded during the 3 sea lion surveys of Kiska.

CONCLUSIONS The Compound 1080 treatment of Kiska Island was completely successful in eradicating the entire arctic fox population in just one treatment. Kiska Island is fox free. Indications are that any non-target poisoning was a very minor occurrence.

MANAGEMENT IMPLICATIONS Data gathered during the previous two years and in future years will be used to help justify registration of Compound 1080 for future use on other refuge islands to benefit migratory birds and the endangered Aleutian Canada goose. The effort on Kiska Island indicates that large islands can be eradicated of fox in an economical and timely fashion.

ADDITIONAL REMARKS

UPDATES OR SUPERSEDES I.D. NO.

PROGRAM

FOR COPIES OF PUBLICATION OR REPORT CONTACT Refuge Manager, Aleutian Islands Unit, Alaska Maritime National Wildlife Refuge, P.O. Box 5251 NAS Adak, Seattle, Washington 98791-0009.

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ACKNOWLEDGEMENTS

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OBJECTIVES

During the nineteenth and early twentieth century, fur traders introduced arctic foxes to the majority of the islands of the Aleutian chain. These islands were previously free of mammalian predators. Populations of arctic fox persist on numerous islands today and in some cases their effect on native avifauna has been devastating. The introduction of arctic fox to the Aleutian Islands is the primary reason for the decline and subsequent endangered species listing of the Aleutian Canada goose and for lower populations or eliminations of some seabird species from numerous islands. The U.S. Fish and Wildlife Service (FWS) is currently undertaking an effort to eradicate introduced arctic foxes on 69,598-acre Kiska Island within the Aleutian Islands Unit of the Alaska Maritime National Wildlife Refuge. This action will have direct and immediate benefits for the indigenous bird populations by releasing them from the limiting effects of arctic fox predation. Equally important to our wildlife conservation mandate, Kiska Island will again be available as nesting habitat for the endangered Aleutian Canada goose.

To accomplish eradication of introduced arctic fox on Kiska Island, the FWS is testing and evaluating the toxicant sodium monofluoroacetate (Compound 1080). Incumbent upon the FWS during fox eradication is the need to: 1) evaluate the effect of the

treatment on arctic fox, the target species; 2) monitor the impact of the eradication program on non-target wildlife, in particular, raptors and avain scavengers; and 3) evaluate and document the recolonization and population trends of other avian species whose populations have been suppressed by arctic fox. These three tasks are, therefore, important objectives ancillary to the prime objective--the removal of introduced arctic fox from Kiska Island. With the successful Compound 1080 eradication effort against arctic fox on Kiska Island, the FWS will seek section 3 (Federal) registration for the use of Compound 1080 from the Environmental Protection Agency (EPA) for use on other select islands to benefit the endangered Aleutian Canada goose and seabirds (Deines 1986).

STUDY AREA

Kiska Island is located in the Rat Island group of the Aleutian Islands, Alaska (Figure 1). The group is mountainous, except for the eastern section of Amchitka which is relatively flat. Kiska is the second largest island in the Rat Island group, containing approximately 28,177 ha (69,598 acres) and 144 km (89.5 mi) of shoreline. Amchitka is the only island in the group larger than Kiska. Kiska Island is irregularly shaped with many large coves and bays and is oriented predominantly in a northeasterly to southwesterly direction (Figure 2). It measures about 38.5 km (22 mi) in length, and varies in width from about 0.9 km (1.5 mi) to 3.7 km (6 mi). The island is rugged and mountainous, with the northern end of the island dominated by the active Kiska volcano. The crater of this volcano has two summits, the higher and most westerly being 1,221 m (4,004 ft) high. Immediately south of the volcano is a low valley about 3 km (2 mi) wide, which contains several lakes. This valley extends nearly across the island from east to west. Flat-topped, boulder-strewn ridges rising to over 305 m (1,000 ft) occur between the lake area and Kiska Harbor. A low, narrow pass cuts across the island from the southwest corner of Kiska Harbor to a small bight on the west coast. South of this pass, the topography consists of sharp, rugged ridges 457 to 518 m (1,508-1,709 ft) high, extending to the southwestern corner of the island. Ridges are quite precipitous on the western side, but slope gradually on their eastern sides to the shoreline of Vega Bay. The valleys and lower slopes of the island are covered with vegetation while the higher elevations are generally bare and strewn with boulders. The shores of Kiska are mostly rock beaches or cliffs (Sekora 1973). Kiska Island has an excellent protected harbor on the east side in about the middle of the island. Located in the Kiska Harbor area are Salmon Lagoon and Trout Lagoon.

During World War II (WWII), the island was occupied by Japanese and later by Americans and Canadians. A portion of the island has been declared a National Historical Landmark due to its WWII significance. War debris litters much of the southern end of the island and is concentrated around Kiska Harbor where a functional pier provides access to the island. Kiska Harbor was the focus of WWII military activity and the hillsides above the harbor are

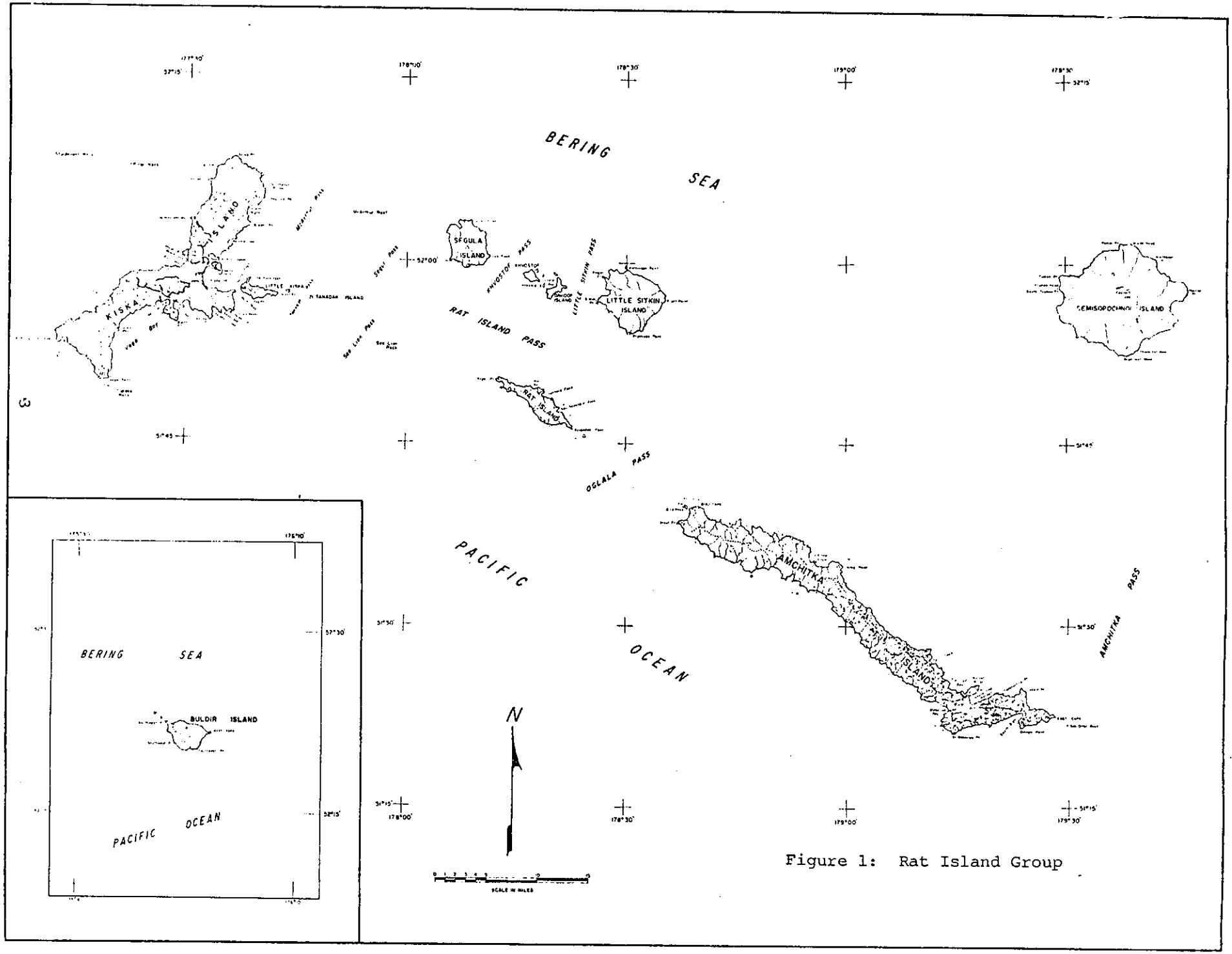


Figure 1: Rat Island Group

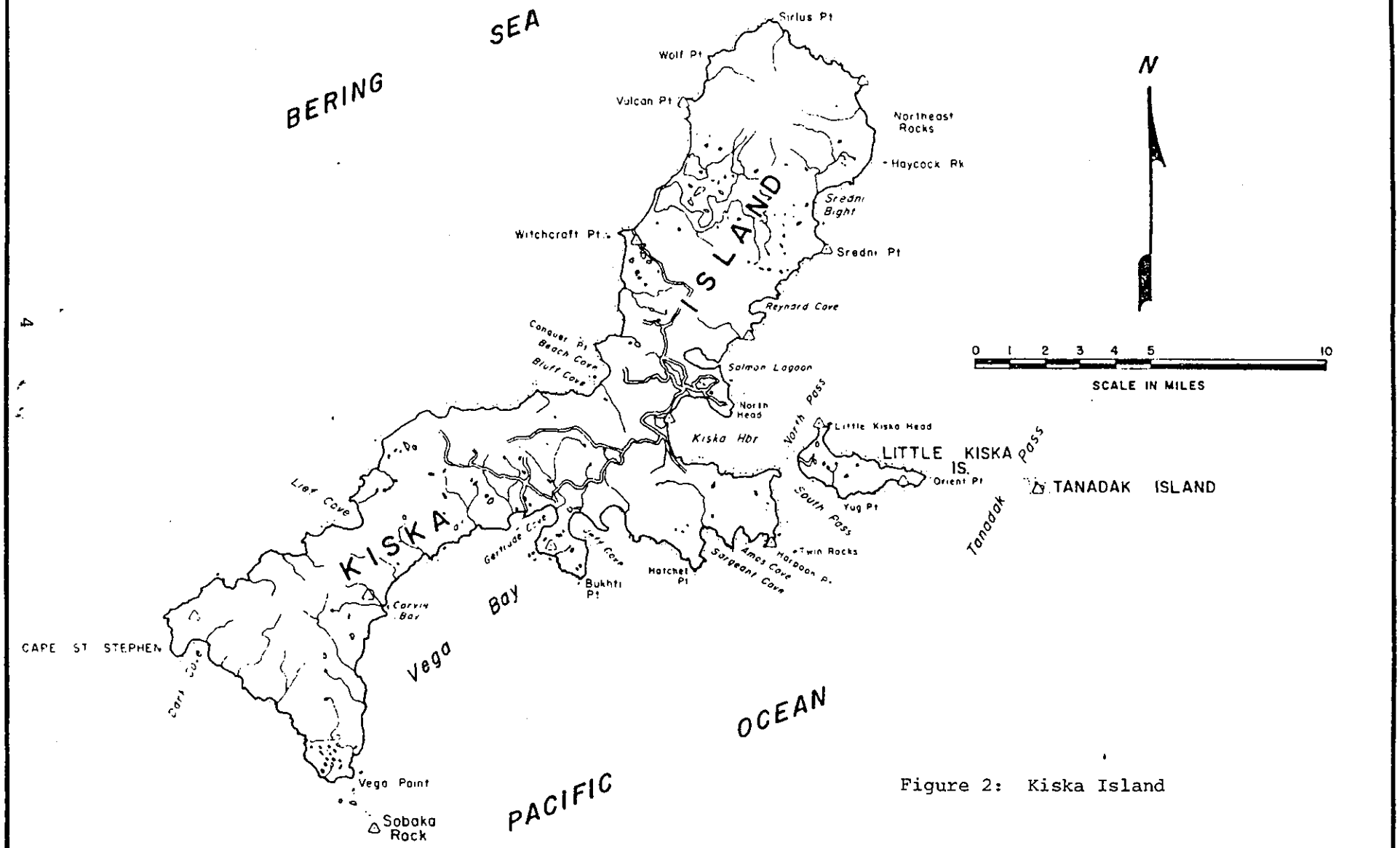


Figure 2: Kiska Island

scarred from aerial bombing raids and shore bombardments. When Kiska was evacuated in 1956, military debris of Japanese and American-Canadian origin was left. Remnants of the Japanese occupation of Kiska include trench systems, tunnels, dugouts, a shrine, anti-aircraft batteries, harbor defense batteries overlooking Kiska Harbor, a one-man submarine and two beached freighters. Other ships are sunk in the harbor. Little remains of the once extensive garrison erected by the American and Canadian forces. The runway matting has been overgrown and the roadways have deteriorated and become partially revegetated. Ruins of buildings and utility systems are strewn over the island along with wreckage of several aircraft. Only two WWII buildings remain standing. One is a large metal quonset hut in the Kiska Harbor area and the other is a wooden building overlooking Witchcraft Point on the west side of the island. The only other structures still standing are about six outhouses. Time and many Aleutian storms have taken their toll and destroyed all other WWII structures. Although a comprehensive road system was built during WWII and is shown on maps (Figure 2), most of it no longer exists. Only a few roads in the Kiska Harbor and runway areas are usable.

Arctic fox, along with a few red fox, were introduced to most of the Aleutian Islands in the 1800's by Russian furriers. Arctic fox were first released on Kiska in 1835. Fox farming was continued by Americans mainly in the 1920's and early 30's. Only Buldir Island, Chagulak Island, and some smaller islands in the Aleutian chain escaped the introduction of foxes, as they were inaccessible by boat due to cliffs and rugged shorelines. Following introduction, fox populations flourished on many islands at the expense of native bird populations. The Aleutian Canada goose is listed as an endangered species predominantly as a result of arctic fox introductions in the Aleutians. Ground and burrow nesting seabird and waterfowl populations were also affected by foraging arctic fox. Impact of foxes on seabird populations can be best indicated by increases of 150 to 1,500 percent for various species on Alaid/Nizki islands since eradication of introduced arctic fox (Zeillemaker and Trapp 1986). The devastation can also be evaluated by comparing results of Murie's 1937 survey with those of the past 10 years.

PAST BIOLOGICAL STUDIES

During a 1937 biological survey of the Aleutians, Murie (1959) observed 41 species of birds on Kiska Island. No Aleutian Canada geese were recorded on Kiska during his survey although observed on other islands. The only species noted as common or abundant were the red-throated loon, harlequin duck, common eider (nesting on offshore rocks), rock ptarmigan, rock sandpiper, glaucous-winged gull, least auklet (a large colony on the north end of the island), rosy finch, song sparrow, lapland longspur and snow bunting. He specifically cited the large least auklet colony on the north end of the island. Murie (1959) stated that the island had an abundance of invertebrated food and that the fox undoubtedly fed extensively on the birds (least and crested

auklets) at the north end of the island and probably prevented many waterfowl from nesting on the island. He collected 131 fox scats while on Kiska and found bird remains in about 21 percent of them. Two things should be noted concerning Murie's surveys: 1) it is the earliest wildlife survey of Kiska accomplished after arctic fox were introduced, and 2) he did not attempt to quantify all the wildlife resources of the island. The size of Kiska, inclement Aleutian weather, and survey technique of the era hampered efforts to conduct comprehensive surveys both then and now.

Although other biologists have visited Kiska on a few occasions in the past, only five previous noteworthy wildlife surveys have been completed in recent years. The limited number of surveys on Kiska is characteristic of most of the Aleutian Islands due to remoteness, difficult working conditions, weather, and limited personnel. The other surveys were completed during the summers of 1978, 1983, 1985, March 1986 and June 1986. The 1985 and June 1986 surveys were in support of the EPA experimental Compound 1080 use permit #6704-EUP-28. The applicable June 1985 and 1986 work will be summarized in this section. Data from those summer surveys for arctic fox, bald eagle, and northern sea lion provide baseline information.

According to Day et al. (1979), there were numerous arctic fox dens in the lava flows within the auklet colony in 1978. Although no attempt was made to estimate or count dens, their number was thought to be quite high. The majority of bird carcasses found in fox food caches were of hatching-year chicks particularly of least auklets. One cache contained at least five crested auklets and fifteen least auklets with the heads bitten off. The young auklets emerge frequently from their nest cavities a day or two before fledging and stand on the surrounding rocks. During that time, they are extremely vulnerable to predation by the introduced arctic fox. Steinacher (1984) conservatively estimated the 1983 Kiska arctic fox population to be 657 animals. That estimate was based on trapping and shooting programs in three specific areas of the island. The number of fox per kilometer of usable shoreline was then determined for those three areas and extrapolated to provide an estimate for the entire island.

In March and April of 1986 as part of the EPA surveying and monitoring of Kiska wildlife, aerial arctic fox surveys were conducted on Kiska. These surveys were conducted to establish and index the islands fox population prior to and immediately after the placement of Compound 1080 baits on Kiska. The surveys were conducted along thirteen transects established at that time to obtain the population index. Five of the initial transects were subsequently discountinued to minimize the impact of the aerial surveys on nesting bald eagles. The eight transects used were located in prime fox habitat on all sides of the island (Figure 3). The transects varied in length from 1.6 miles to 7 miles have a mean length of 4.0 miles and totaled 32.3 miles.

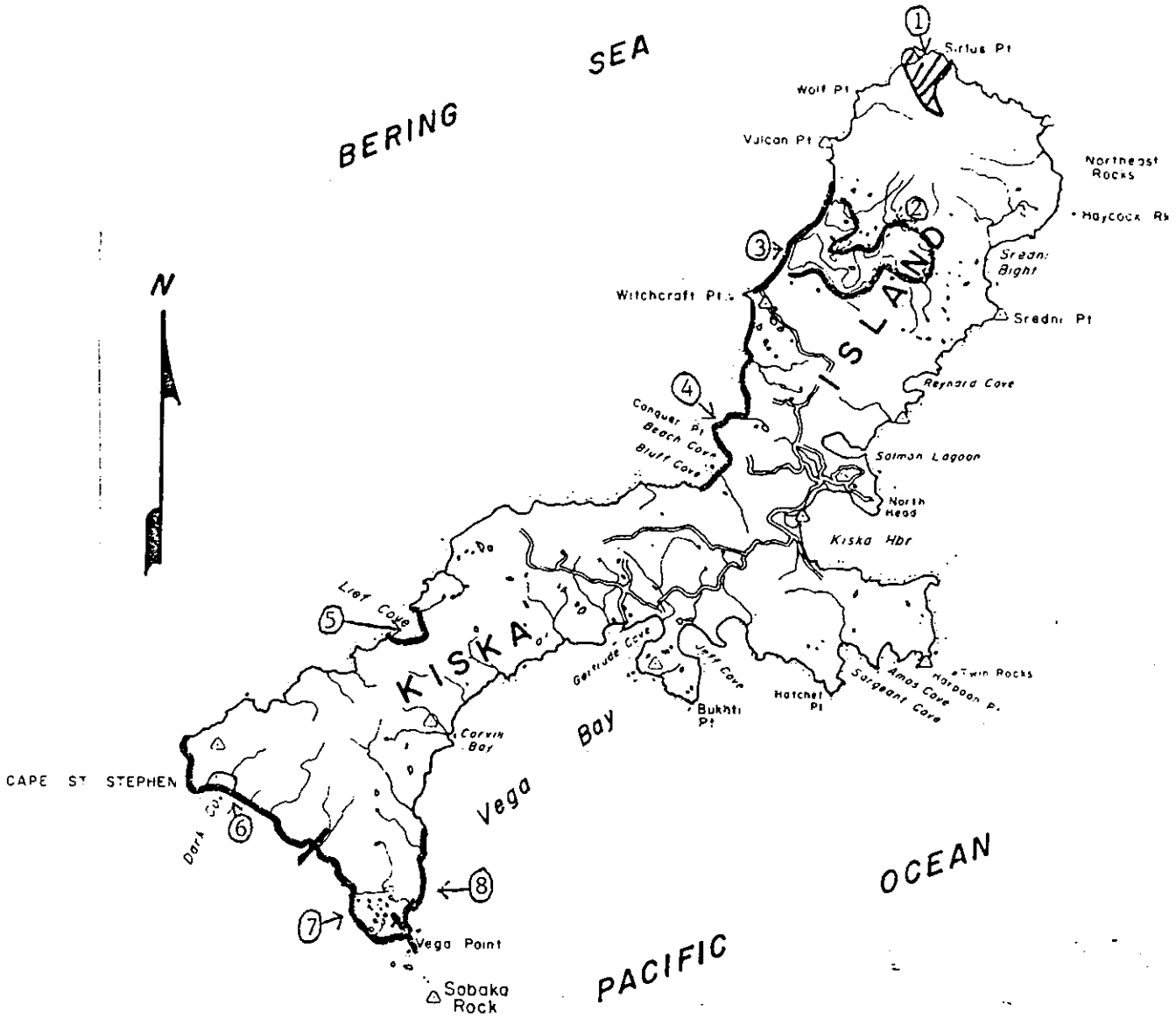


Figure 3. Location of arctic fox survey transects established on Kiska Island, March 1986.

Four pre-baiting arctic fox surveys were flown between 26 March and 29 March 1986. All fox surveys were conducted in the late afternoon or early evening except one conducted on 27 March 1986. A morning survey was attempted on that day in hopes that fox surveys could be run twice a day. Only 43 fox were observed on this survey as compared to an average of 101 on the afternoon/evening surveys thus the morning survey idea was discarded. The low number of fox observed was probably due to the fact that the nocturnal fox are at the end of an activity period rather than a beginning as they would be in the evening. The remaining three pre-baiting fox surveys produced good results with numbers ranging from 87 to 114 with a mean of 101 fox observed for all 9 transects each day. Transect number 2 around Kiska Lakes

had the lowest mean number of fox observed each day with 0.7 animals. This is somewhat understandable since these lakes probably have little to offer as a winter food source. Transect number 6 at Cape St. Stephen had the highest mean number of fox observed each day with 30.3 animals. Transect numbers 5, 6, and 8 all had high mean densities of 6.1, 7.6, and 6.2 fox/mile of shoreline. All of these transects are located in excellent fox habitat with good food resources. Transect number 5 had a dead beached sperm whale and number 6 had a northern sea lion haulout area in it. Transect number 8 is located on the southeast corner of the island with a mixture of sand and gravel beaches where the prevailing SW storm winds would wash food ashore.

After completing the pre-baiting wildlife surveys, Compound 1080 single dose baits (SDB's) were distributed over Kiska Island by hand placement from the helicopter over a 4-day period from 30 March to 04 April 1986. A total of 48,727 baits were dropped or placed, concentrating along the shorelines, upland fox trails, and the auklet colony at the Sirius Point lava flows. To lessen the potential impact of secondary poisoning problems to bald eagles, all accessible arctic fox carcasses were retrieved after the initial baiting. Carcass pickup began on 31 March during follow-up baiting when 12 carcasses from several locations around the island were picked up. In total, 132 arctic fox carcasses were retrieved by the field crew. Fifty-four additional fox carcasses were located in inaccessible areas and could not be retrieved. In addition to the fox carcasses, two glaucous-winged gull carcasses, one glaucous-winged gull wing, and one sea lion pup carcass were also retrieved for potential secondary poisoning analysis. Of the 132 fox carcasses retrieved, 81 were weighed and sexed. Forty-six of the carcasses (57 percent) were female and 35 (43 percent) were male. Weights of the foxes ranged from 2.8 kg to 6.4 kg with the heaviest male 1 kg heavier than the heaviest female. The remaining carcasses were not weighed or sexed due to limited time. Sixty-six foxes had their hindquarters removed and sent to the Denver Wildlife Research Center (DWRC) for Compound 1080 analysis along with the gull and sea lion carcasses. The sea lion carcass showed no trace of Compound 1080. The glaucous-winged gull carcasses, however, did show 1.8 and 3.3 micrograms of Compound 1080 per gram of sample (ppm). All 132 fox carcasses were buried in a collapsing World War II tunnel located in the Kiska Harbor area. The area was marked with two Carsonite posts with Compound 1080 poison warning signs.

Three post-baiting fox surveys were flown on 1, 3, and 4 April. The first survey was accomplished over an entire day while picking up fox carcasses. The final two surveys were conducted in the early evenings at a similar time frame as the pre-baiting fox surveys. During the first survey, 7 live arctic fox were observed in the fox transect areas with 12 live foxes observed outside the transect areas. This total of 19 live foxes observed on the island-wide survey compares with 144 arctic fox seen 24 March on the familiarization flight. Compound 1080 baits were dropped over each area where a live fox was observed. Only two live foxes were

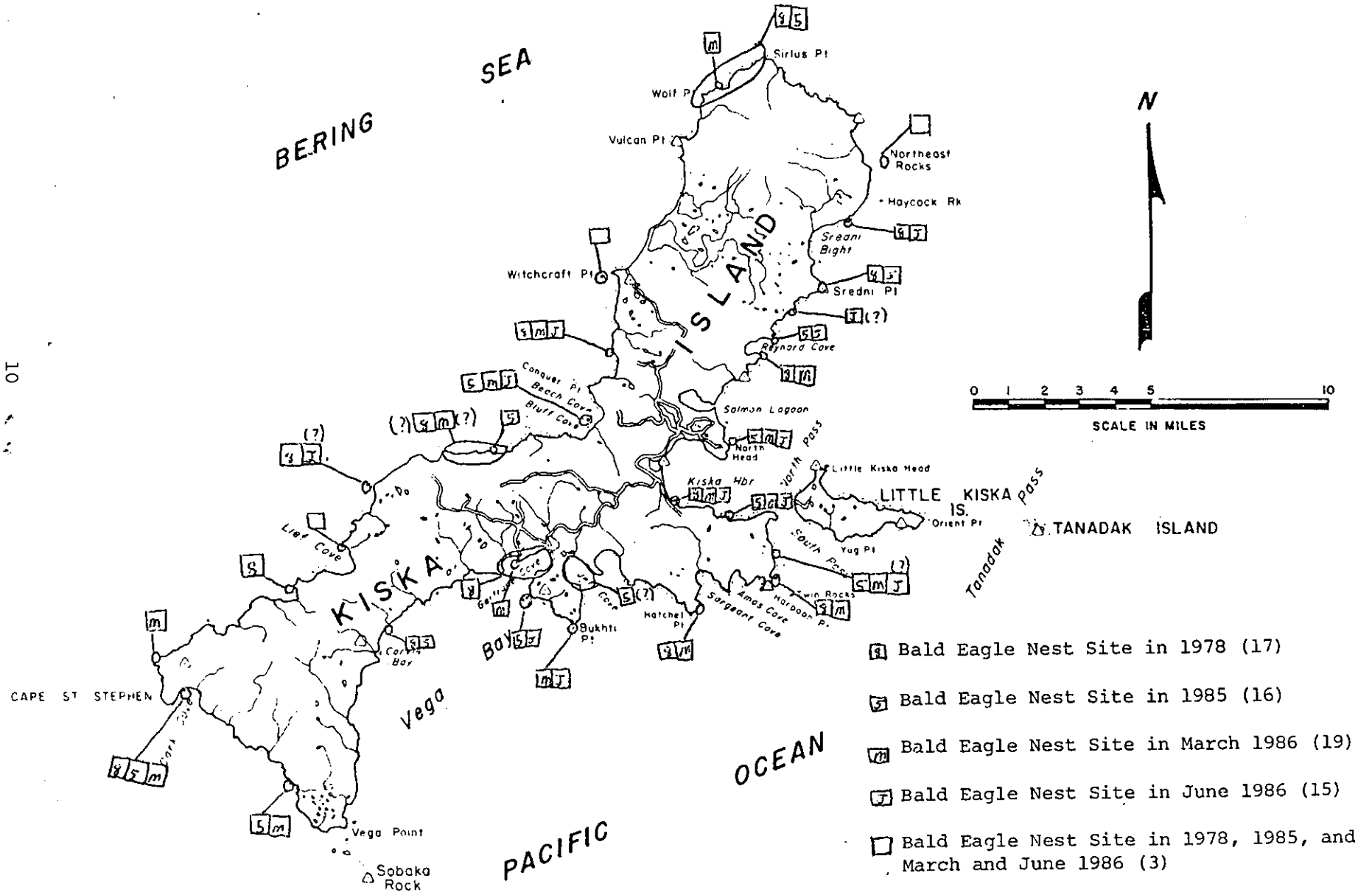
seen on the second survey and one on the third and final post-baiting survey. A comparison of pre- and post-baiting fox observations shows some dramatic changes. Pre-baiting fox observations on transect number 6 with the greatest number of observations averaged 30.3 animals. Post-baiting conditions on the same transect only averaged 1.0 animals. The highest mean density of arctic fox was found on transects 5, 6, and 8 with 6.1, 7.6, and 6.2 fox per mile of habitat in pre-baiting conditions. Post-baiting fox surveys found these densities dramatically changed to 0.43, 0.25, and 0.10 respectively. The average number of fox observed on all daily pre-baiting surveys was 101. Post-baiting arctic fox surveys averaged only 3.3 live animals. If the first island-wide survey is not included in the calculations, then the average was only 1.5 live arctic fox observed on the post-baiting surveys. More detailed information concerning the March 1986 Kiska work can be obtained in the report entitled "Introduced Arctic Fox Compound 1080 Baiting and Wildlife Surveys, Kiska Island, Aleutian Islands, Alaska - 24 March-4 April 1986 (In Support of EPA Experimental Use Permit 6704-EUP-28)."

Kiska bald eagles and their aeries were surveyed in 1978, 1985 and March/June 1986. Day et al. (1979) conducted the surveys using an inflatable boat near shore. In June 1985 and 1986, surveys were conducted using a 27 m (85 ft) charter vessel about 0.40 km to 0.81 km (1/4 to 1/2 mi) from shore depending on the shoreline configuration and safety. The surveys in March 1986 were conducted via a Bell 412 helicopter flying at an elevation of 300 to 500 ft. Although three different survey methods were utilized over several years, the results for aerie observations were similar as shown in Figure 4. Three aeries were recorded in the same general location during all 4 survey years.

Marine mammals were also recorded in 1978 by Day et al. and in March/April 1986 by Deines et al. Day et al. (1979) estimated a total sea otter population of 1,832 of which 1,374 were adults in the combined Kiska, Little Kiska, Tanadak and Tanadak Pass areas. Using an inflatable boat, Day et al. (1979) recorded a total of 6,066 northern (or Steller) sea lions with large concentrations observed at the following locations: 1) Cape St. Stephen, 2) near Lief Cove, and 3) Vega Point (Figure 5). Day et al. (1979) also recorded a total of 670 northern sea lions on Tanadak Island.

Deines et al. (1986) observed an estimated 3,100 northern sea lions during their 24 March orientation flight of Kiska via the Bell 412 helicopter. The sea lions were concentrated north of Lief Cove (est. 2,000) and at Cape St. Stephen (est. 700) which was also where Day et al. observed large sea lion concentrations in 1978. One specific sea lion survey was conducted on 29 March by Deines et al. (1986) via the helicopter with a total of 1,347 sea lions observed (Figure 5). Forty-seven percent of the sea lions were observed between Cape St. Stephen and Vega Point, including Sabaka Rock. Other areas of sea lion concentrations were north of Lief Cove and the northern end of Kiska Island.

Figure 4: Location of bald eagle aeries observed in 1978, 1985, March 1986 and June 1986 on Kiska Island



Note: Aeries with question marks in parenthesis probably exist but are not known for certain. Also, the larger the circle for the nest site, the more uncertain we are about the exact location of the aerie.

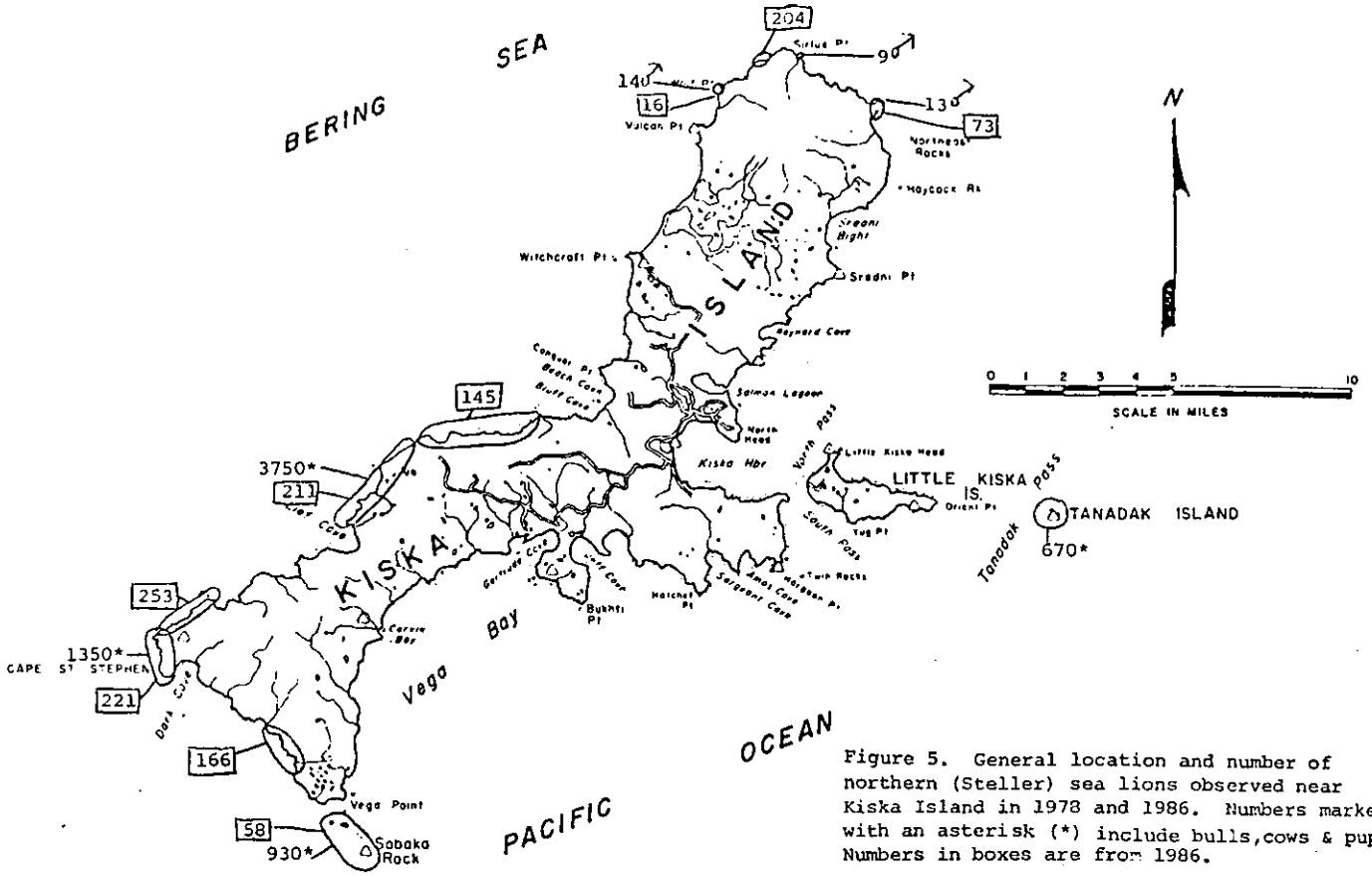


Figure 5. General location and number of northern (Steller) sea lions observed near Kiska Island in 1978 and 1986. Numbers marked with an asterisk (*) include bulls, cows & pups. Numbers in boxes are from 1986.

METHODS AND MATERIALS

Wildlife surveys were conducted on Kiska Island from 25 March 1987 to 30 March 1987 primarily using a Bell 412 helicopter (Figure 6). These surveys concentrated on arctic fox, bald eagles, and northern sea lions.

A brief summary of Kiska field activities accomplished in March and April 1987 is presented in the Appendix.

ARCTIC FOX SURVEY

The eight arctic fox transects established in March 1986 (Figure 3) were replicated in 1987. The transects were established in what was thought to be prime fox habitat. This was based primarily on the availability of food resources in the area. The width of the transects varied from 100 m (110 yd) to 300 m (330 yd) depending on the topography and terrain. Large flat areas were encountered on Vega Point while the arctic fox habitat was limited to basically the immediate shoreline at Witchcraft Point. All transects except two covered coastline areas. Transect number 2 covered inland habitat around the perimeter of the lakes on the northwest side of the island (Figure 3). Transect number 1 encompassed the auklet colony on the north end of the island. Transects were located on all four sides of the island and were placed in the better fox activity areas. The transects were

intentionally established in areas which had a greater density of arctic fox and would produce the best possible contrast between pre- and post-baiting populations.

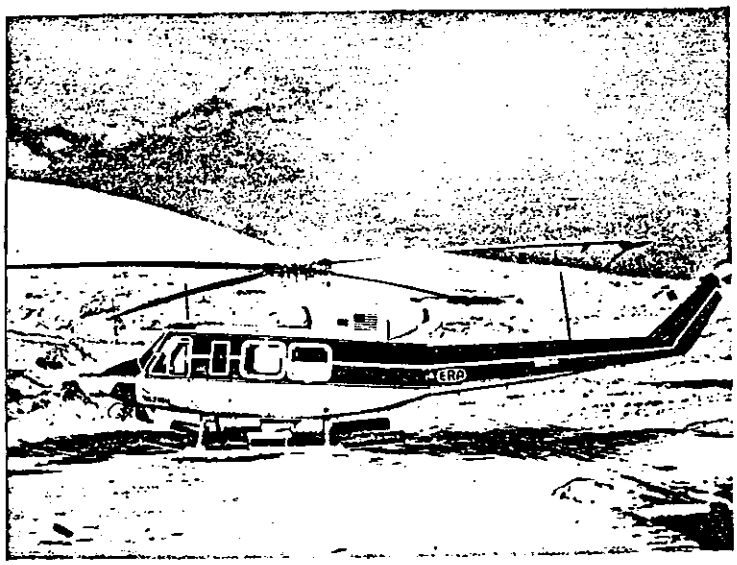


Figure 6. Bell 412 helicopter used for wildlife surveys and Compound 1080 bait distribution on Kiska Island, March 1987.

The eight fox survey transects varied in length from 2.6 km to 11.3 km (1.6 mi to 7 mi) with a mean length of 6.52 km (4.0 mi). The shortest and longest transects were located on the west side of the island at Lief Cove and Kiska Lakes respectively. The eight arctic fox transects total 51.7 km (32.3 mi) in length. Mensural data for the arctic fox transects, including map coordinates for beginning and ending points, are given in Table 1.

All arctic fox transects were conducted using the helicopter as the observation platform. Four primary observers were used. Two sat in the passenger area with one looking forward and the other rearward. A third observer sat amidship somewhat between the pilot and copilot looking forward. The pilot or copilot, whoever was not flying, was the fourth observer. All observers and the pilots functioned as one team and visually searched all habitat for fox during the survey. Because of some difficulty in locating arctic fox (i.e., in the auklet colony) and differences in individual view area, no attempt was made to divide observers into two or more observation teams. This multiple team approach was attempted during one bald eagle survey in 1986 and proved unsuccessful. All fox survey flights started from Kiska Harbor and proceeded north to the auklet colony. The colony was the first transect conducted and was followed by the Kiska Lakes and Boulder Beach transects. The survey then continued with the Witchcraft Point transect and proceeded counterclockwise around

Table 1. Mensural data for arctic fox survey transects established on Kiska Island, March 1986.

Transect #	Name	Map Coordinates Begin	End	Transect Length in km(mi)	Remarks
1	Sirius Pt (Old Lava)	N/A	N/A	3.9 km (2.4 mi)*	Pattern cover in corkscrew flight
	Sirius Pt (New Lava)	N/A	N/A	2.6 km (1.6 mi)*	Pattern cover in corkscrew flight
2	Kiska Lakes	37.8/70.5	36.2/67.6	11.36km (7.0 mi)	End SW edge of W Kiska Lake near ponds
3	Boulder Beach	37.8/70.5	34.5/66.6	4.7 km (2.9 mi)	End slightly before Witchcraft Pt.
4	Witchcraft Pt.	34.5/66.6	32.4/59.4	10.3 km (6.4 mi)	
5	Lief Cove	22.4/54.4	21.5/53.3	2.6 km (1.6 mi)	Dead sperm whale on beach
6	Cape St. Stephen	13.6/49.0	18.8/45.2	64 km (4.0 mi)	Not including Dark Cove because of active eagle aerie end at Forked Stream
7	Southwest Vega Pt.	18.8/45.2	22.5/41.9	5.8 km (3.6 mi)	Begin at Forked Stream and end at WWII camp on Vega Pt
8	North Vega Point	22.5/41.9	23.0/46.0	4.5 km (2.8 mi)	Begin at WWII camp on Vega Point

* Measurement of perimeter of area and not an actual transect length because of flight pattern.

the island. The barometric pressure, time of high and low tides, general weather conditions, and start and end time for each transect were recorded during the flight.

All fox surveys were conducted in the late afternoon or early evening. The fox surveys were flown at speeds of 75 to 100 knots approximately 50 m (165 ft) to 100 m (330 ft) offshore and generally at 30 m (100 ft) to 60 m (200 ft) elevation. Survey conditions varied slightly due to terrain and weather conditions. Incidental wildlife observations were also made while conducting the fox surveys.

BALD EAGLE SURVEYS

Bald eagle surveys established in 1986 on Kiska and Little Kiska Islands were replicated in 1987 and flown in a manner similar to the fox surveys except at an elevation of 300 to 500 ft. The location of all aeries were plotted on scale maps and the number of adult and juvenile birds observed were recorded. Bald eagle surveys were generally conducted in the late morning or early afternoon and covered the entire shoreline of the island, lasting about 2 hours. As the locations of each aerie were plotted, additional care was taken in later flights to minimize disturbance to the birds. The same number of observers and seating arrangement used on the arctic fox surveys were used on the bald eagle surveys.

NORTHERN SEA LION SURVEYS

Northern sea lion surveys of Kiska and Tanadak Islands were conducted in March 1987 replicating techniques established in March 1986. The sea lion surveys on Kiska started at Northeast Rocks and continued counterclockwise around the island to Twin Rocks. The helicopter then proceeded to Tanadak Island where the entire shoreline was surveyed. These surveys were accomplished in the late afternoon hours using the helicopter as an observation platform. The same number of observers and positions were used as in arctic fox/bald eagle surveys. The helicopter hovered over the sea lions at a minimum elevation of 360 m (1,200 ft) and the animals were counted using 10x40 binoculars. Two observers counted each group of sea lions and the numbers were then averaged. Additional counts were made on some groups of sea lions when the observers had difficulty counting them.

COMPOUND 1080 BAIT WEATHERING STATIONS

Three bait weathering stations were established in the Kiska Harbor area in March 1986 and were constructed of 1.2 cm (1/2 in) welded wire and were approximately 30 cm (1 ft) x 30 cm (1 ft) in size. They were placed at three locations in the harbor area and were staked and tied into place. Twenty-four Compound 1080 SDB's were initially placed in each station.

Six SDB's were to be removed from each station during subsequent summer and winter visits. Poison warning signs were placed in the Kiska Harbor area at the pier, carcass disposal site, metal quonset hut, and the three bait weathering stations. Signs were attached to Carsonite posts or stapled to wooden posts or logs as appropriate. Additional signs were stapled to logs at both ends and in the center of Gertrude Cove. The two locations represent the areas where most visitors land on Kiska Island.

RESULTS AND DISCUSSION

The weather proved to be a challenging adversary this year in attempting to duplicate the wildlife surveys established in 1986. It began with cold temperatures and icing conditions which caused some minor problems on the charter vessel "Maritime Maid" (Figure 7). Icing conditions and an electrical problem delayed departure from Adak until 23 March. The weather on Kiska was worse then normal winter weather (see Appendix). Intense winter storms with gale force winds and rain or snow are common during winters in the Aleutians.

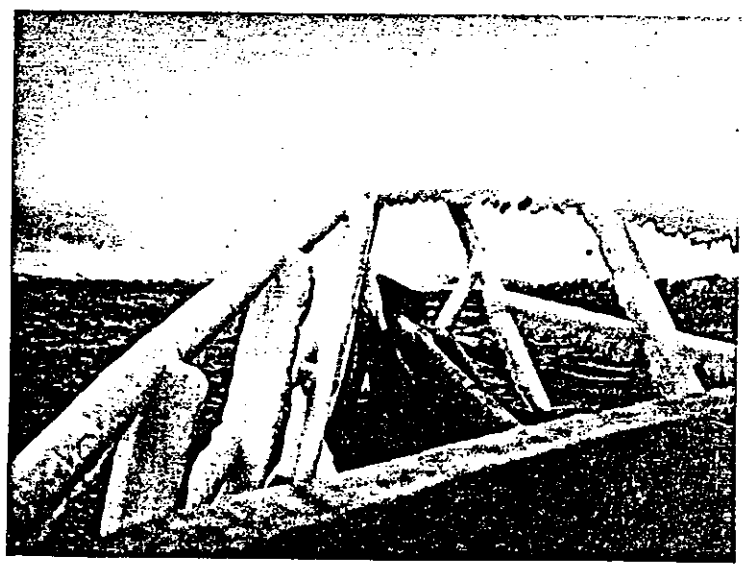


Figure 7. Ice buildup on bow rail of charter vessel "Maritime Maid" as it approached Kiska Island (March 1987).

Normally, however there is a break with good weather in between these storms. This spring, the storms came one right after another with no good weather breaks. Work on Kiska was completed just ahead of the second worst storm ever recorded in the Aleutians (930 mb barometer reading). This storm delayed return of the charter vessel to Adak by almost 2 days.

One good thing came from all the intense stormy weather. Fresh snows occurred several times prior to surveys which allowed for a

thorough search for fox tracks. Three fox surveys were flown during the early evenings (1700 to 1900) using the methods and the eight transects established in 1986. The arctic fox surveys were conducted on the 27th, 28th and 29th of March 1987. No arctic fox or fox sign were observed on these surveys (see Appendix for field data sheets). This compares with the 1986 results of an average of 101 arctic fox observed on pre-baiting surveys and 1.5 or 3.3 fox observed on post-baiting surveys depending on how the results were computed. In addition to the actual arctic fox transect surveys, landings were made in four areas which had high fox densities in 1986. These areas were Kiska Harbor, Lief Cove, Cape St. Stephen and Vega Point. The sandy beach of Kiska Harbor provides excellent scavaging habitat for arctic fox, but no fresh sign or fox were found. In 1986, Lief Cove was the sight of a dead sperm whale and a high of 30 arctic fox were observed there on one occasion. This year the whale was gone and so were the fox. No fresh fox sign was observed at Lief Cove either. Cape St. Stephen and Vega Point have areas where northern sea lion's haul out on shore. Arctic fox were concentrated in these areas in 1986, but no fresh sign or fox were observed there in March 1987.

In addition to the absence of arctic fox or fresh fox sign in the four landing areas, an abundance of rat signs were observed this year. Fresh rat burrows, trails, scat and evidence of feeding in the kelp along the beach were noted at all locations in 1987. A few rat burrows were even noted in old fox trails. The abundance of rat sign in 1987 was vastly different from 1986 when such sign had to be looked for and was not as prevalent. The presence of the rat sign in these areas is in itself positive evidence that arctic fox are no longer on Kiska Island.

Finally, while conducting island-wide bald eagle surveys and northern sea lion surveys, incidental searches were made for arctic fox or fresh fox sign. It should be noted that on two of the morning bald eagle surveys conducted on 27 and 28 March 1987, there was fresh snow all the way down to the beach. If there were any live fox still remaining on Kiska, their tracks would have been easily observed in the fresh snow. No arctic fox tracks or sign were observed on those two bald eagle surveys with fresh snow or on any other wildlife surveys. Based on the facts that no arctic fox were observed on the fox transects, no arctic fox or fresh sign were observed in thorough ground searches in four areas of previous high fox densities, the abundance of rat sign in these four areas, and the absence of arctic fox or fresh sign on other wildlife surveys (especially the two bald eagle surveys with fresh snow), it was felt that the baiting of Kiska Island with approximately 48,000 Compound 1080 SDB's in March 1986 has been successful in eradicating all the fox on the island. Such results were far beyond anyones belief when the experimental study was first initiated during the summer of 1985.

Bald Eagle Surveys

Island-wide bald eagle surveys of both Kiska and Little Kiska islands were conducted using the helicopter to document the nesting population. The surveys were conducted during the late morning or early afternoon (0925-1505).

Weather during the bald eagle surveys, as well as the other surveys conducted in March 1987, was quite variable compared to the blue skies and calm winds encountered in 1986. Snow squalls (Figure 8), rain and wind had to be contended with on almost every survey in 1987, but the conditions did not adversely affect observation conditions. If the observation conditions were significantly affected by the weather, the helicopter was landed and the survey delayed until they improved. A total of three bald eagle surveys were conducted on 27, 28 and 30 March 1987 (results from each survey contained in Appendix).

Figure 8. An approaching snow squall on the west side of Kiska Island near Witchcraft Point, March 1987.

The total number of bald eagles observed per day on Kiska during the surveys ranged from 38 to 49 (Table 2). In 1986, the total number of bald eagles observed ranged from 43 to 50 (Deines et al. 1986). An average of 37 adult and 6 immature bald eagles were observed in 1987 which compares closely with the 1986 helicopter surveys when an average of 38 adult, 7 immature and 2 unknown age bald eagles were observed (Deines et al. 1986). The adult bald eagle observations in 1987 were very consistent with 37, 38 and 38 birds being observed on the three surveys respectively. The adult observations in 1986 were also consistent, except for the first

survey day when only 25 adults were observed (Deines et al. 1986). The immature bald eagle observations were variable during both years, but this is to be expected as they are difficult to observe due to their overall dark color, lack of territoriality and tendency not to flush easily from their perches. Also, if disturbed, immatures may fly to nearby islands. The results from the 1987 survey compares favorably to the 33 adult and 1 immature bald eagles observed in June 1986 (Deines and McClellan 1987) and 34 adults and 8 immature bald eagles observed in June 1985 (Deines 1986).

Table 2. Results from island-wide raptor surveys conducted on Kiska Island, March 1987.

		Bald Eagle			Peregrine
Date	Observer	Adults	Immature	Total	Falcon
3-27	Everyone	38	11	49	5
3-28	Everyone	37	1	38	7
3-30	Everyone	38	6	44	8
Mean		37.6	6	43.6	6.6

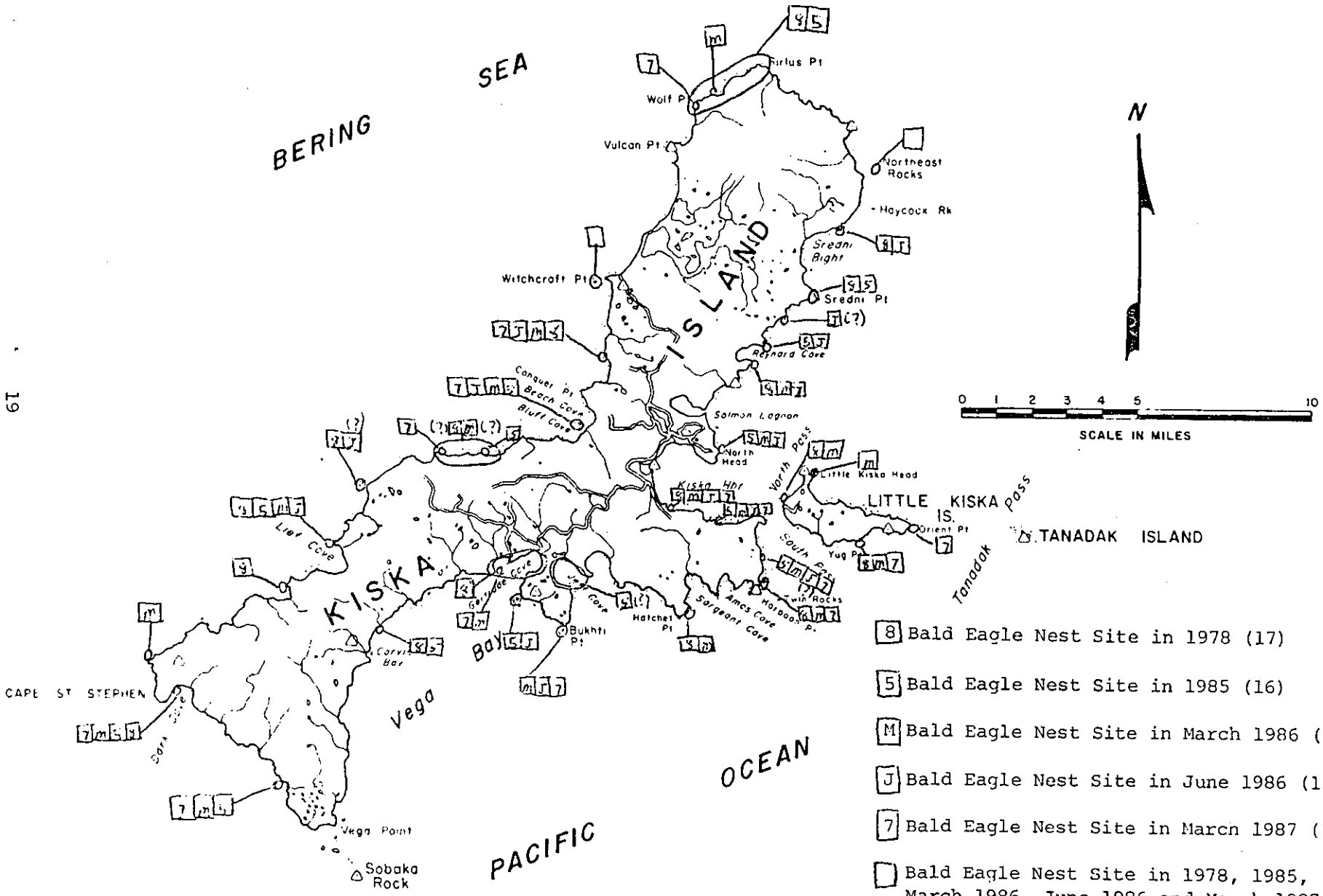
The total number of bald eagles observed per day on Little Kiska during the 1987 helicopter surveys averaged six adults and four immatures, (Table 3) which compares closely with the average of seven adults and one immature observed during the 1986 helicopter surveys (Deines et al. 1986).

Table 3. Results from island-wide raptor surveys conducted on Little Kiska Island, March 1987.

		Bald Eagle			Peregrine
Date	Observers	Adults	Immature	Total	Falcon
3-27	Everyone	7	2	9	4
3-28	Everyone	4	6	10	1
3-30	Everyone	7	4	11	0
Mean		6	4	10	1.6

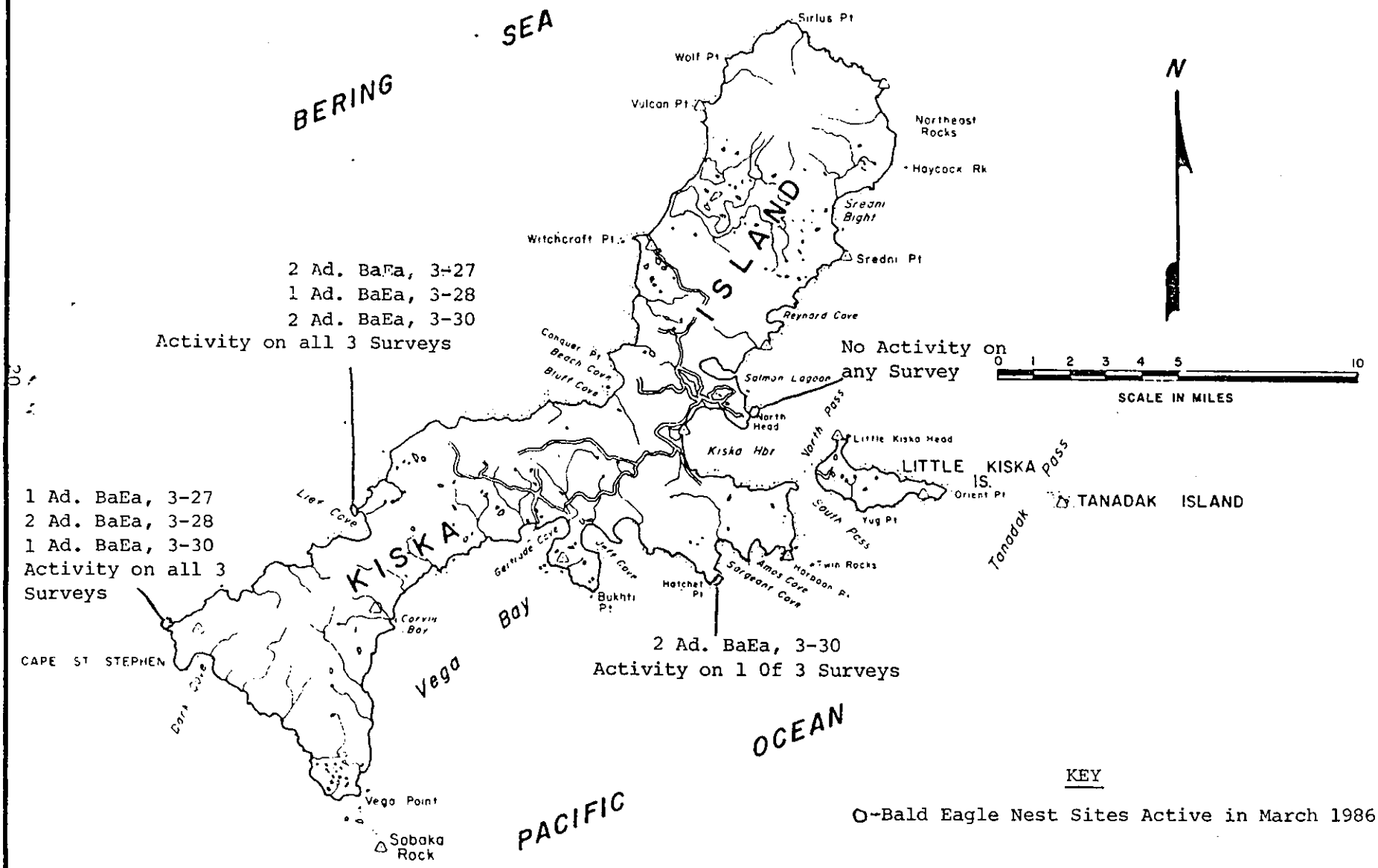
A total of 15 active bald eagle aeries were located on Kiska Island during the March 1987 surveys (Figure 9) compared to a total of 19 located in March 1986 (Deines et al. 1986). Although four less active aeries were observed in March 1987, it was felt that the nesting phenology of the bald eagles had been delayed by the cold temperatures and snow cover. Of the four aeries active in 1986 but not active in 1987 (Figure 10), adult bald eagles were active around three of the nest sites. Adult bald eagles were observed on all three survey days at past nest sites at Lief Cove and Cape St. Stephen. Adult bald eagles were also observed at the past nest site at Hatchet Point on 1 of the 3 days of surveys. Only at the 1986 nest site off North Head were there no signs of adult bald eagle activity in March 1987. The 15 aeries located in March 1987 compares to the 15 aeries located in June 1986 (Deines and McClellan 1987), 16 aeries located in June 1985 (Deines 1986)

Figure 9. Location of bald eagle aeries observed in 1978, 1985, March 1986, June 1986 and March 1987 on Kiska and Little Kiska Islands.



Note: Aeries with question marks in parenthesis probably exist but are not known for certain. Also, the larger the circle for the nest site, the more uncertain we are about the exact location of the aerie.

Figure 10. Location of bald eagle nest sites active in March 1986 but not active in March 1987. Adult bald eagle activity observed around each nest site during bald eagle surveys conducted on 27, 28 and 30 March 1987, Kiska Island.



and the 17 aeries located in 1978 (Day et al. 1979). In addition, two bald eagle aeries were located on Little Kiska Island in March 1987 (Figure 9) which is comparable to the three aeries observed on Little Kiska in March 1986 (Deines et al. 1986) and two in 1978 (Day et al. 1979).

Only three aeries with eggs were observed in March 1987 compared to nine aeries with eggs observed in March 1986 (Deines et al. 1986). This is a further indication that the nesting phenology was delayed in 1987. The raptor surveys on Kiska in 1987 and 1986, however, were both conducted prior to the peak of egg laying on Adak which normally occurs in mid-April (Kline 1983). The three aeries with eggs observed in 1987 each contained a different number of eggs. One nest contained three eggs, another two eggs and the third nest one egg. In March 1986, two-thirds of the nests with eggs also had a multiple number of eggs.

During all the surveys, every effort was made to flush as few as birds as possible; thus the observers were not provided an opportunity to see into every nest. Again this year, the eagles seemed to become acclimated to the helicopter flights and appeared to flush less often during later surveys. Also birds flushed during later surveys did not appear to fly as recklessly or as far as they did on the first surveys. As the parents invest more time in the reproduction effort, the less likely they are to flush or fly very far from the nest.

Peregrine Falcons

Incidental peregrine falcon observations were also recorded during the raptor surveys with an average of seven observations on Kiska (Table 2) and two on Little Kiska (Table 3). This compares closely with the average of six observations on Kiska and two on Little Kiska recorded during the raptor surveys in March 1986 (Deines et al. 1986). The results from 1987 also compare closely with the six peregrine falcons recorded during the island-wide boat circumnavigation in June 1986 (Deines and McClellan 1987). Day et al. (1979) recorded two aeries or four adult peregrine falcons on Little Kiska in 1978.

Northern Sea Lions

A more comprehensive survey of the northern sea lion population of Kiska Island was accomplished in March 1987 with three specific sea lion surveys conducted (results from each survey contained in Appendix). Each survey was conducted from Northeast Rocks around the west side and south end of Kiska to Twin Rocks. The surveys were flown at 1200+ feet to minimize disturbance to the sea lions (Figure 11).

Figure 11. A view of northern sea lions from 1200 ft during a helicopter survey.

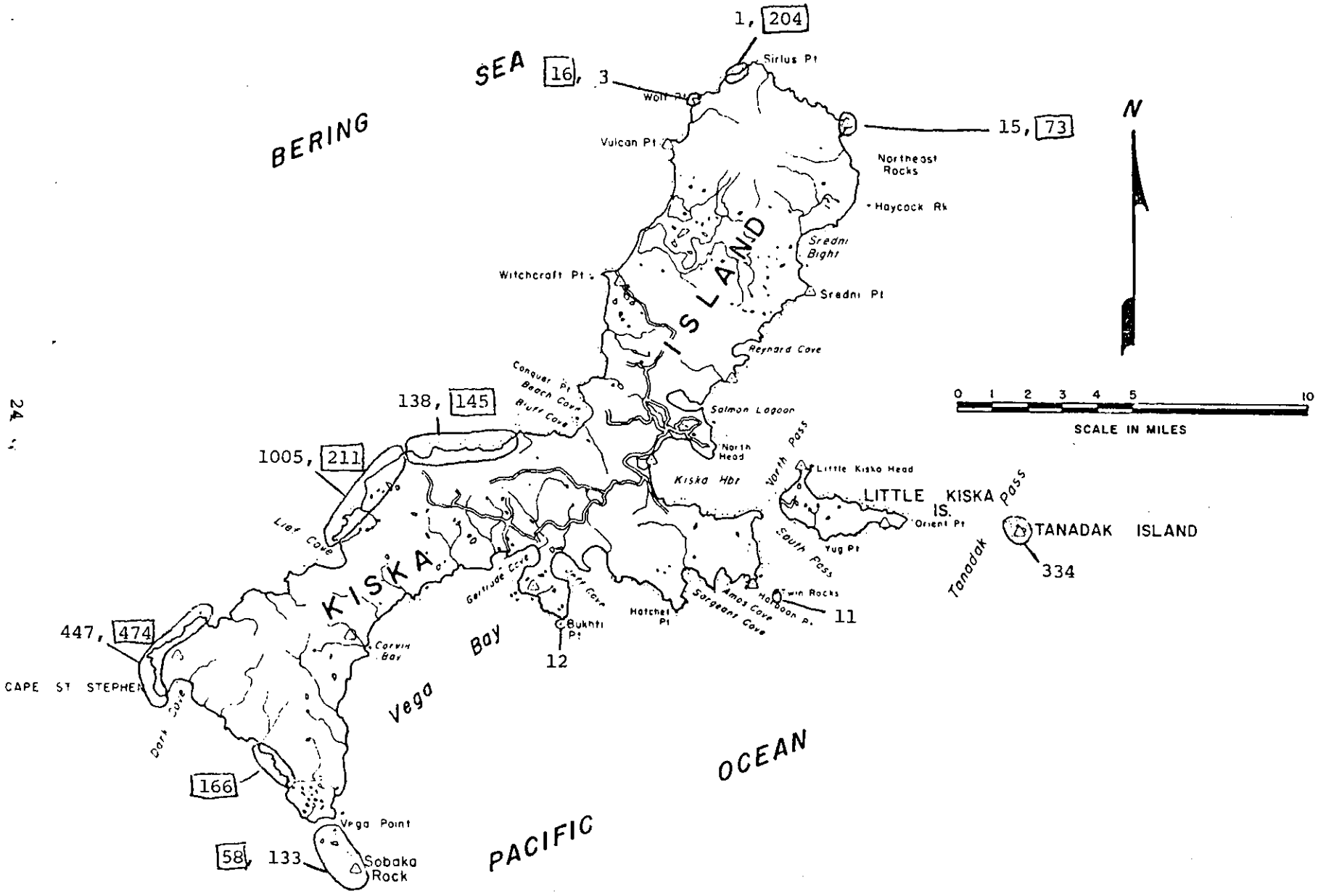
Two observers made separate counts using 10x40 binoculars. The two counts were averaged to get a mean count for each group of sea lions observed. The totals for the 3 days of counts ranged from 1,595 to 1,952 with a total mean of 1,765 (Table 4). This is an increase over last years total of 1,347 (Deines et al. 1986) on one survey. The sea lions were concentrated in two areas with 65 percent of the sea lion observations recorded between Lief Cove and Bluff Cove and 33 percent at Cape St. Stephen and Sabaka Rock (Figure 12) Day et al. (1979) also found the highest sea lion concentrations north of Lief Cove and at Cape St. Stephen in 1978. The sea lion estimate made in March 1986 during the orientation flight also recorded large sea lion concentrations north of Lief Cove (est. 2000) and at Cape St. Stephen (est. 700) (Deines et al. 1986). Although the total number of northern sea lions was higher in 1987 than 1986, there is also some change in use areas. Two areas with large numbers of sea lions observed in March 1986, but not March 1987, included NW of Vega Point and the north end of Kiska (Figure 12). New locations of sea lion observations recorded in 1987 but not 1986 included Bukhti Pt, Sargeant Cove and Twin Rocks (Figure 12, Sargeant Cove observation not shown).

Day et al. (1979) observed 6,066 northern sea lions (see Figure 5) during their island circumnavigation via inflatable boats in 1978. The lower numbers observed in 1987 and 1986 may be attributed to: 1) the season or time of year, 2) the moving platform of the helicopter causing binocular vibrations and making clear observation difficult, 3) the helicopter disturbing the sea lions and causing them to run into the water, 4) time of day of the counts, and/or 5) part of the overall decline in sea lion populations throughout the Aleutians.

Table 4. Results from northern sea lion surveys conducted on Kiska and Tanadak Islands, 28-30 March 1987.

Location	Date-Time-Start -End	28 March 1505 1614 # Obs.	29 March 1457 1614 # Obs.	30 March 1624 1752 # Obs.	Mean
NW of Northeast Rocks		18	12	14	15
Sirius Point		2	0	1	1
Wolf Point		5	4	0	3
East of Gray Hill		151	135	128	138
Gray Hill to Lief Cove		995	1103	916	1005
Cape St. Stephen		452	455	434	447
Sabaka Rock		113	197	89	133
Bukhti Point		0	32	3	12
Sargeant Cove		0	1	0	0
Twin Rocks		11	13	10	11
Totals		1747	1952	1595	1765
Tanadak Island		336	333	334	334

Figure 12. General location and number of northern sea lions observed near Kiska Island, March 1987 and March 1986. Numbers in boxes represent observations from surveys conducted in 1986.



Three sea lion surveys of Tanadak Island (Figure 12), which is east of Little Kiska Island, were also conducted in March 1987. The totals for the 3 days of counts were consistent and ranged from 333 to 336 with a mean of 334 (Table 4). Tanadak Island was not surveyed in 1986 due to a lack of time, but Day et al. (1979) recorded 670 sea lions on Tanadak Island during their surveys in 1978.

While conducting a ground search for fox sign northwest of Vega Point, a group of approximately 200 sea lions were observed. The observers were able to get within 20 yards of one end of the group. One bull and one cow had open wounds around the neck indicating past or present entanglement with rope or net debris of some kind. No netting or twine was actually observed on either animal. The bull appeared quite healthy while it was not possible to determine the health status of the cow as she was asleep and not disturbed during our presence.

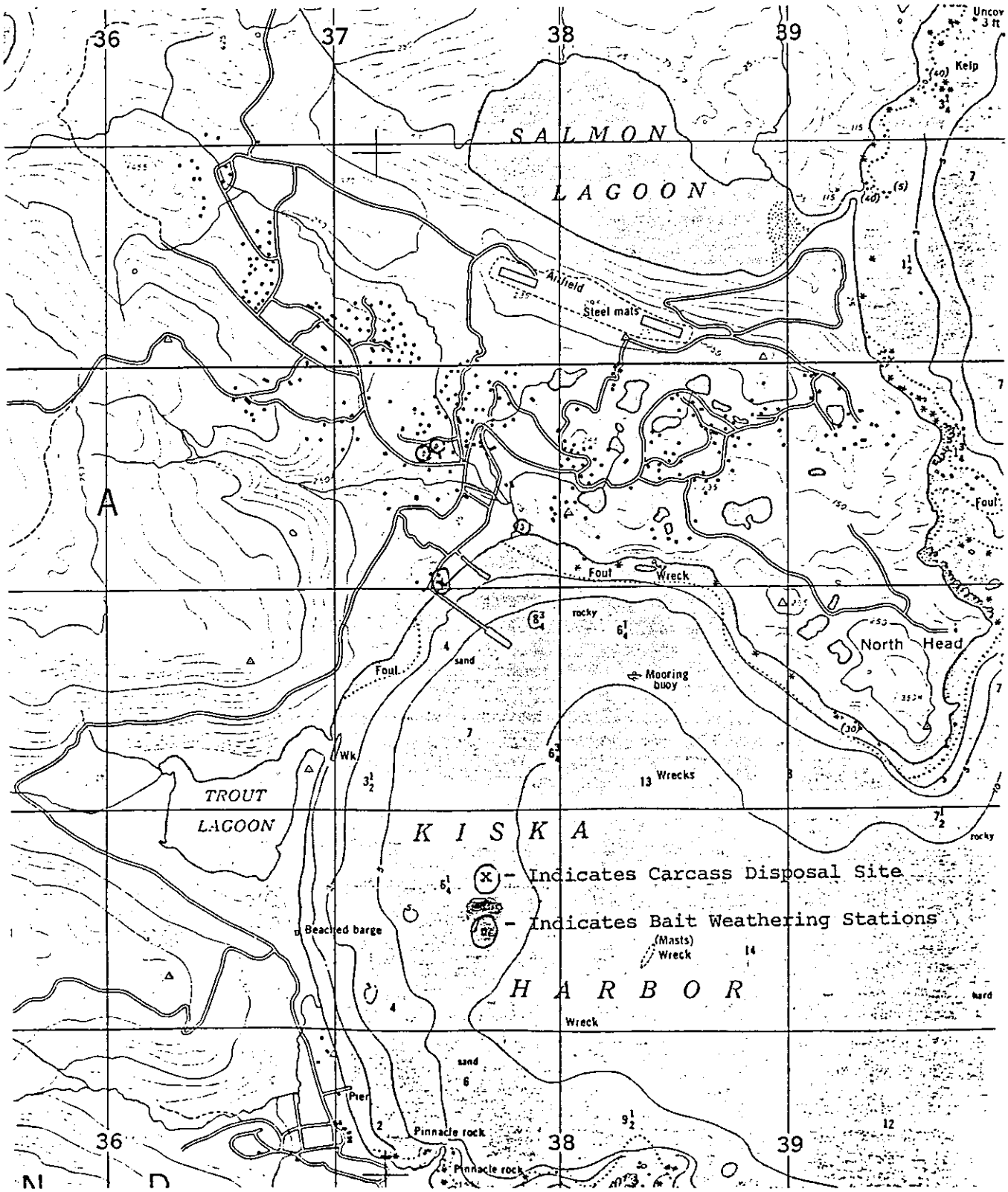
COMPOUND 1080 BAIT WEATHERING STATIONS

Three SDB weathering stations were established in the Kiska Harbor area (Figure 13) in March/April 1986 with 24 Compound 1080 SDB's contained in each station. One station was placed in a sandy Elymus-grass habitat about 20 m above the outflow of the stream at the north end of Kiska Harbor. The other two SDB weathering stations were placed about 60 m west and northwest of the northwest corner of the WWII "Rusty Arch" quonset hut used in the 1985 and 1986 summer field study.

Six SDB's were taken from each station in March 1987 and were shipped to DWRC for bait biodegradation analysis. The bait weathering station located at the north end of Kiska Harbor had been moved and a hole had been punctured into one of the sides. The cause of this damage is unknown. The station was found tied down at the fox burial site (Figure 13). Four SDB's were missing from the station. A fisherman informed us that he found the station washing in the surf and tied it down at the fox burial site. The weathering station was repaired and put back at its original site except for being moved further inland about 15 yards. The new site is more hidden and should be less noticeable; however, it is still marked with a Carsonite post. Eight SDB's remain in the bait weathering station located at the north end of Kiska Harbor. Twelve SDB's remain in each of the bait weathering stations located NW of the "Rusty Arch."

Six SDB's had been taken from each bait weathering station in June 1986 and shipped to DWRC for bait biodegradation analysis. Results from the analysis of these SDB's showed insignificant weathering effects during the 11-to-12 week exposure period. No Compound 1080 SDB's from the March 1986 baiting were found on Kiska where the four ground searches were conducted in March 1987.

Figure 13. General location of arctic fox carcass disposal site and compound 1080 bait weathering stations on Kiska Island.



Beach Survey

On 25 March 1987, a partial beach survey was conducted on a segment of the previously established north beach survey transect. Observers walked along the sandy beach leading up to Salmon Lagoon and along the southeast shore of Salmon Lagoon. Eight bird species and one mammal species were observed (Table 5) all in Salmon Lagoon. As was the case last year, the common goldeneye was the most numerous species with 126 observed. Four white-winged scoters which had not been previously documented on Kiska during March were also observed. The beach survey results from March 1986 and 1987 indicate that Salmon Lagoon is important to migratory birds. No fox tracks or sign were found anywhere along the lagoon or sandy beach. One carcass, which appeared to be a female bufflehead, was found.

Table 5. Wildlife observed on partial north beach transect survey on Kiska Island, March 1987.

Wildlife Species	# Observed
Greater Scaup	1
Black Scoter	34
White-winged Scoter	4
Common Goldeneye	126
Bufflehead	7
Red-breasted Merganser	11
Rock Ptarmigan	1
Winter Wren	1
Sea Otter	1
TOTAL	186

CARCASS DISPOSAL SITE

At the request of the state historic preservation officer, the carcass disposal site used in April 1986 was reopened and several artifacts from the 1980's were put in the hole to date the skeletons and to avoid possible confusion in any future rediscovery of the skeleton material. The artifacts were a small juice can and a large glass jar containing a 1983 penny and dime, a 1982 quarter and nickel plus a note. The note read: "This WWII Japanese tunnel was used as a disposal site for 132 arctic fox carcasses killed in 1986 with Compound 1080 as part of an experimental study approved by the Environmental Protection Agency (EPA). This disposal site was also approved by the state historical officer". The hole was recovered with rock and dirt and marked with a Carsonite post.

Finally, it should be noted that due to the absence of any fox observations or sign during any of the surveys, no Compound 1080 baits were dispersed in March 1987.

RECOMMENDATIONS

The following recommendations are based on the results of the post-baiting survey effort and should be implemented to the maximum extent practicable:

1. That six Compound 1080 SDB's be retrieved from the bait weathering stations during the summer of 1987.

2. That additional checks for arctic fox or fresh sign on Kiska be conducted during the summer of 1987.

3. That Norway rat surveys be conducted on Kiska, Amchitka and Adak islands to determine the significance of the rat population increase on Kiska Island.

4. That post-baiting surveys be conducted during the summer of 1988.

5. That additional post-baiting wildlife surveys to document the recovery of endemic wildlife populations be conducted at 5 (1992) and 10 year (1997) intervals after baiting.

6. That the results of this experiemtal study, when completed in June 1988, be utilized to seek authorization from EPA to use Compound 1080 SDB's on other select Aleutian Islands (see Fox Management Plan and Addendum) to eradicate introduced arctic fox to benefit migratory birds.

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