

ORIGINAL

PROGRESS REPORT:

**Bald Eagle Nesting and Reproductive Success
Along the Pacific Coast of the Alaska Peninsula/Becharof
National Wildlife Refuge, Cape Kubugakli to Cape Kunmik,
10 May-25 July, 1989**

by

Donna A. Dewhurst

Key Words: Alaska Peninsula, Haliaeetus leucocephalus,
Becharof, productivity, Oil Spill, Pacific Coast, bald
eagle

U. S. Fish and Wildlife Service
Alaska Peninsula/Becharof National Wildlife Refuge
P. O. Box 277
King Salmon, Alaska 99613

October 1989

ABSTRACT

Bald eagle (Haliaeetus leucocephalus) nesting success was examined along the Pacific coast of the Alaska Peninsula, from Cape Kubugakli to Cape Kunmik, during the summer of 1989. Seventy-two nests were examined, with 36 nests fledging 57 young. Nearshore islets were used more frequently for nests than the other available habitat types. Three abandoned eggs were collected for hydrocarbon analysis.

INTRODUCTION

Bald eagles (Haliaeetus leucocephalus) are abundant along the waters of the Pacific Ocean throughout Alaska (Murie 1959, King et al. 1972,); however, baseline information on relative abundance, distribution and production is lacking for the Alaska Peninsula (Sowl 1982). Within the last decade, surveys have been conducted to determine distribution and abundance on the Peninsula (Sowl 1982, Hodges 1983, Payne 1987, Payne 1988) indicating the highest densities along the Pacific coast.

In March 1989, the 11-million gallon Exxon Valdez Oil Spill impacted the entire length of the 725 miles of Pacific shoreline (Cape Kubugakli to Chichagof Bay) contained within the Alaska Peninsula/Becharof National Wildlife Refuges (APNWR) and the 100+ nearshore islands and islets managed as the Alaska Peninsula Unit of the Alaska Maritime National Wildlife Refuge (AMNWR). Aerial random plot surveys of APNWR eagles established in 1983 (Payne 1988) and repeated in 1987 (Payne 1987) provided pre-oil data of Pacific coast eagle distribution, forming a baseline for oil spill damage assessment studies.

METHODS AND STUDY AREA

The study area extended from Cape Kubugakli south to Cape Kunmik, along the Pacific coast of the Alaska Peninsula, including the nearshore islands (Figure 1). The Refuge coast consists of approximately 350 miles of rugged shoreline formed by the junction of the Aleutian Mountain Range and the Pacific Ocean. Kodiak Island is located 30 miles east of the study area, separated by the Shelikof Strait from Cape Kubugakli to Cape Igvak. Along the Peninsula, the study area is bounded by Katmai National Park and Preserve to the north and Aniakchak National Monument and Preserve to the south.

The entire coastline of the study area was aerially surveyed using a chartered Bell 206 Jet-Ranger helicopter and a Service Cessna 206 fixed-wing aircraft on floats. A helicopter was used in all surveys except the final flight checking for fledgling eaglets (Appendix I). On the initial survey, active nest

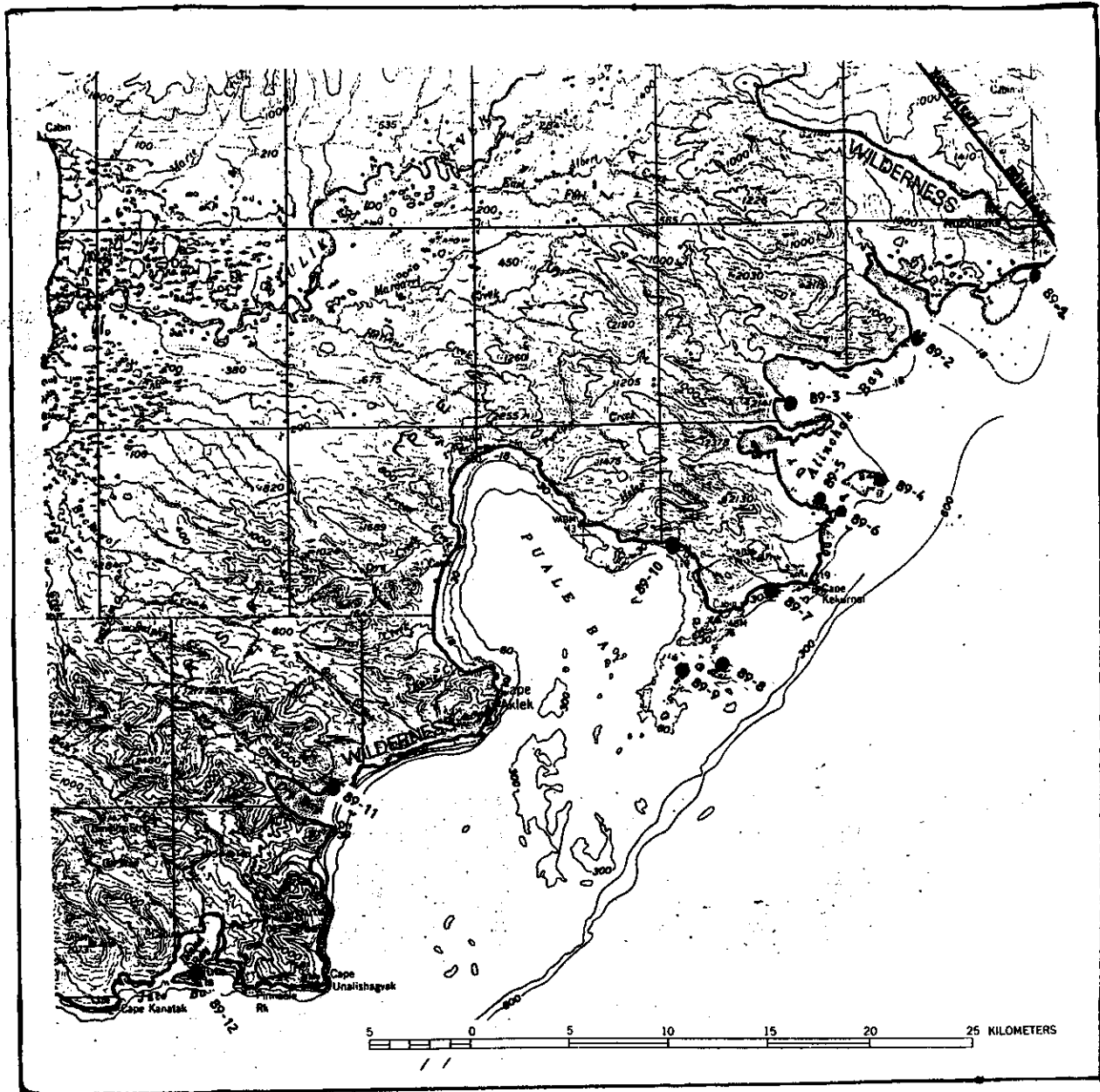


Figure 1. Bald eagle nests located on the Pacific coast of the Alaska Peninsula, Cape Kubugakli to Cape Kanatak, May- July, 1989.

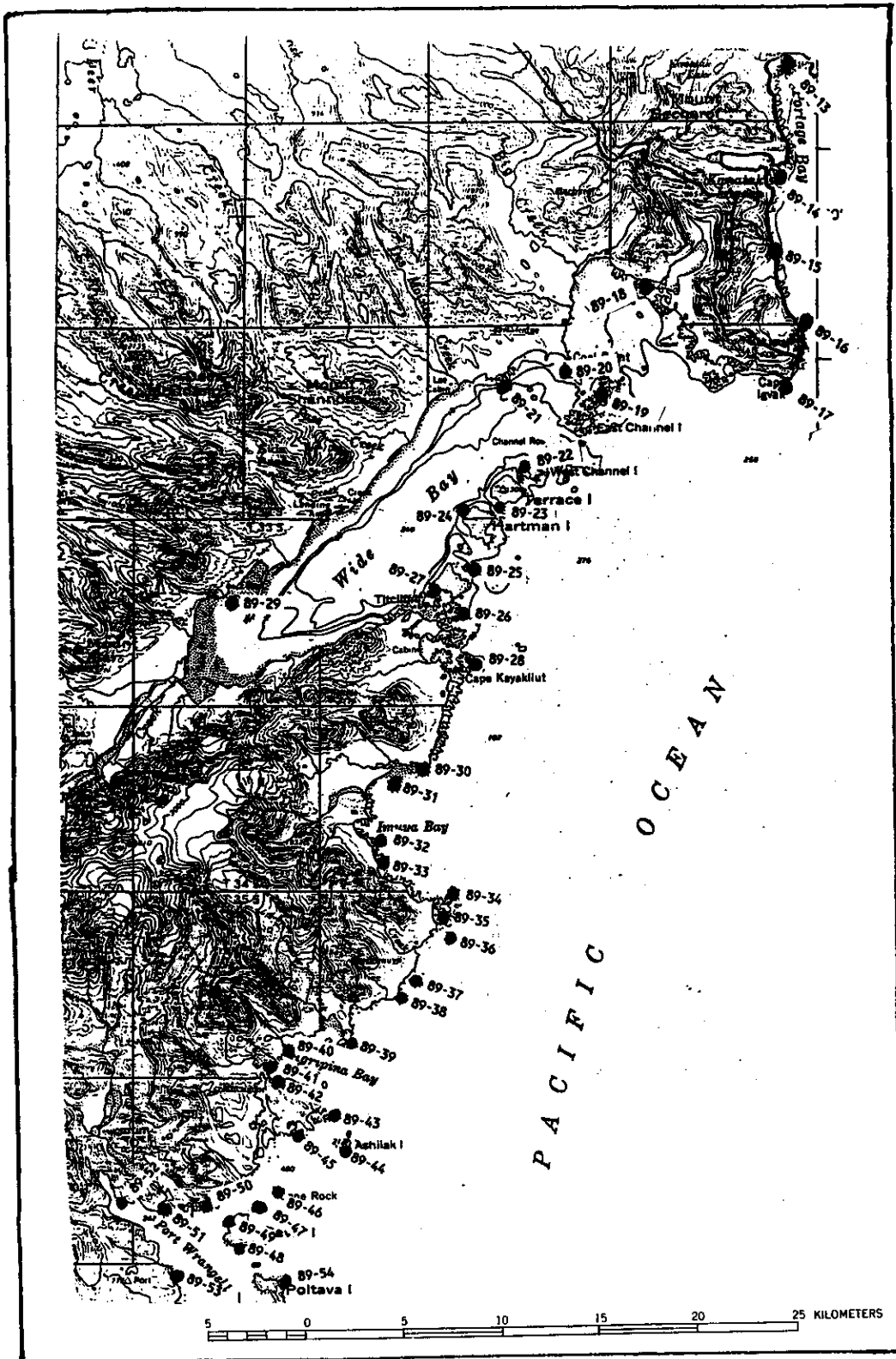


Figure 2. Bald eagle nests located on the Pacific coast of the Alaska Peninsula, Cape Kanatak to Cape Providence, May- July, 1989.

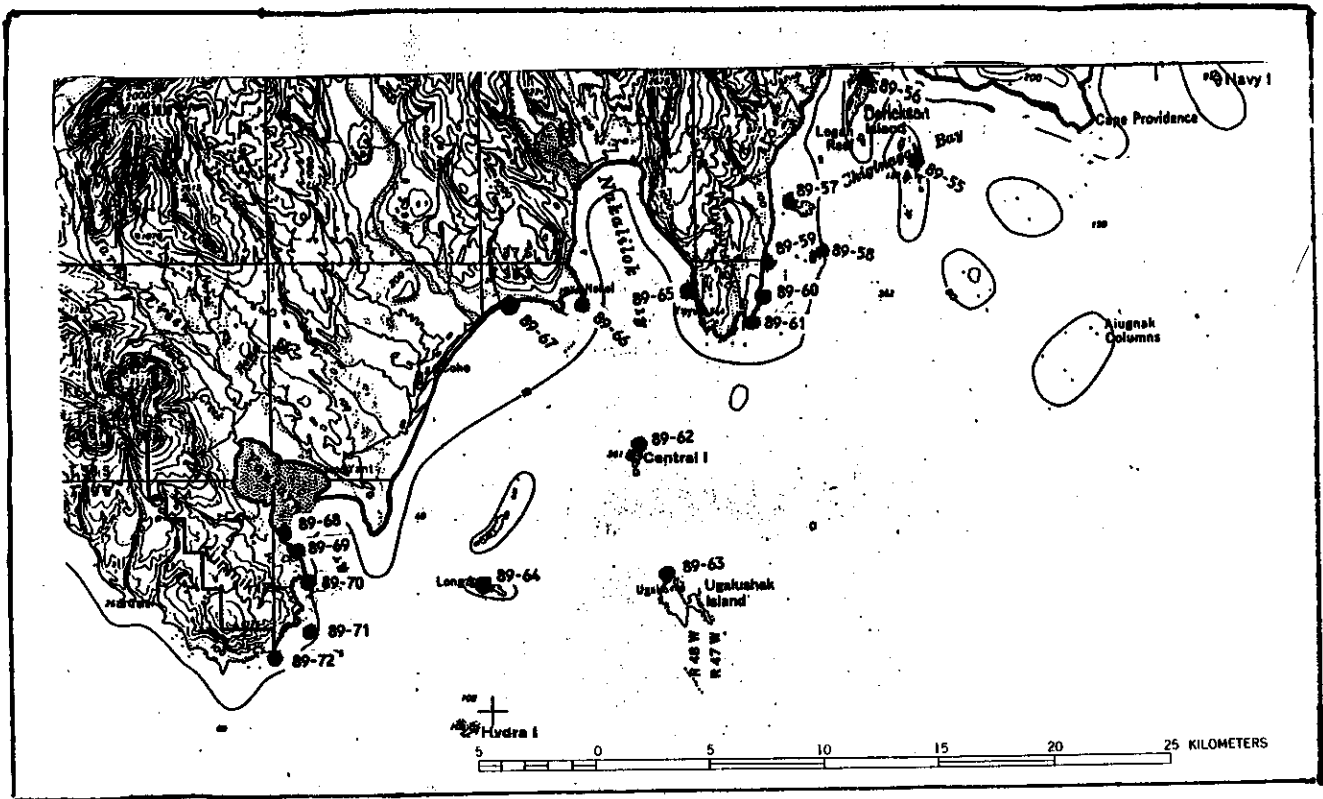


Figure 3. Bald eagle nests located on the Pacific coast of the Alaska Peninsula, Cape Providence to Cape Kumukuk, May- July, 1989.

locations were marked on 1:63,360 series topography maps. Active nests were those possessing two or more of the following items: fresh nesting materials, 1-2 adult eagles actively defending nest, adult eagle in incubating posture, egg(s) present, or young present.

Helicopter use was necessary, during the second and third surveys, to gain foot access to the nests. Nests determined as active on the first survey, and not on the later surveys, were examined for any sign of oil, predation, disturbance or any egg/young remains. Any eggs appearing to be abandoned (not protected or tended by adults), were collected for hydrocarbon testing.

Survey terminology was simplified for ease of recording. Observed eaglets were classified as either downy, partially-feathered or fully-feathered. Nest sites not tended by adults were classified as "no young observed" until the nest became overgrown and not evident, and then it was classified as "no nest observed."

RESULTS AND DISCUSSION

Nest Sites

Seventy-two bald eagle nest sites were recorded during the survey (Figures 1-3), representing the highest number of nests documented for the refuge coastline. SOWLS (1982) conducted the earliest documented eagle survey of the Pacific coastline in 1973 using the motor vessel Aleutian Tern, but recorded only 15 nests along the same length of coast as the present survey. In 1976, Troyer examined nests from Cape Kubugakli to Kekurnoi Islets and recorded 8 nests - 1975, 7 nests - 1976, and 6 nests -1977, corresponding to 9 nests observed during the 1989 survey (map in Alaska Peninsula/Becharof Refuge files). In 1987, Payne (1987) surveyed the Pacific coast using a Cessna 206 fixed-wing aircraft and observed 101 nests from Cape Kubugakli to Stepovak Bay, but lost data prevents any further comparisons.

Habitat use by nesting eagles along the Alaska Peninsula indicated a preference for offshore islands/islets (Table 1). No theory is being offered for the more frequent use of offshore islands observed. In similar available habitat (treeless Alaskan coastal tundra), sea stacks were significantly preferred for use in the Aleutian Islands (Sherrod et al. 1977, Dewhurst 1988), likely due to adaptation to the introduction of a land predator (artic foxes Alopex lagopus). However, along the Alaska Peninsula and adjacent islands, land predators (foxes, bears...) are common and do not appear to influence habitat selection by nesting eagles.

Table 1-- Bald eagle nest site selection and success rate among differing habitat types, from Cape Kubugakli to Cape Kunmik, Alaska Peninsula, Alaska, 10 May-25 July.

Habitat Types*	# Nests	# Young Downy	# Young Fledge**	% Nest Success
Sea Stack	15	20	17	66%
Coastal Ridge	6	3	2	67%
Connected Stack	4	6	4	50%
Islets	38	32	29	77%***
Hillsides	9	7	5	71%
Total	72	68	57	56%***

* Sea stacks - pinnacles sticking out of the sea,
Ridges - small peninsulas still connected to the mainland,
Connected Sea Stacks - ridges that have been partially worn away, leaving a stack joined to the mainland by a lower, saddle-shaped arm,
Islets - similar to sea stacks except with the width at the top being greater than the height to the top,
Hillsides - side of a hill on the mainland (Sherrod et al. 1977)

** Fledge-- young observed during final survey

*** Nests not visited on all surveys were not included in this calculation

Productivity

Sixty-five active nests were recorded during the initial surveys, with eggs or young visible in only six of these nests (Appendix II). The incubating behavior exhibited by adult eagles frequently prevented observation of clutch sizes.

Sixty-eight young were produced from the 72 nests surveyed (Table 1). The mean number of young observed per successful nest was 1.6. Stratifying the brood size data by survey date, the mean decreased over time (19 June - 1.6, 4 July - 1.5, 24 July - 1.3). Possible causes for eaglet mortality include fratricide, sibling competition (Sherrod et al. 1977, Bortolotti 1986), and unknown oil-related causes. No intact eaglet carcasses were found during the survey, to collect for necropsy.

Mortality/ Nest Failure

Fifty percent (Appendix II) nest failure was recorded for the 72 nests surveyed. Six abandoned/failed nest sites were examined for any evidence of oil, carcasses or other evidence to determine the cause of failure. These sites included: 89-9, 12, 23, 28, 33, 67 (Appendix II). Two abandoned nests were examined on the islands in Wide Bay and revealed signs of nest destruction by brown bears (Ursus horribilis) including extensive nest site digging, feces, and one tuft of bear fur. Other than bear damage, no further causes for nest abandonment were observed. No sign of oil or oiled prey was observed in any of the abandoned nests. An increase in helicopter/fixed-wing overflights, related to oil spill activity, were observed along the coast this summer, but direct nest harassment was not observed. One adult bald eagle carcass was recovered by Exxon clean-up crews in Puale Bay during July, but was not submitted for necropsy analysis for cause of death.

In another attempt to determine causes of nest failure, abandoned eggs were examined for any oil spill related natality. Eggs appearing abandoned during the second nest survey (4-5 July) were considered targets for collection for hydrocarbon testing. Twelve eggs were observed during the second survey; however, only one egg was collected. The egg collected appeared dirty, with a black, tar-like substance marking the shell. During the third survey (24-25 July), only three abandoned eggs were observed, with two collected. We were not able to collect all abandoned eggs due to nests on sea stacks too small for helicopter landing. An additional problem discovered in egg collection methodology was the required subjective decision to decide when eggs were neglected enough to be considered abandoned. Of the 11 eggs not collected during the second survey; two hatched, six were lost and three remained intact in the nest, during the period between the second and third surveys.

Observability of Nests/Young

Adverse weather, varying observers, and aircraft type used decreased the accuracy and precision of the overall productivity survey. The initial "nest finding" flights were conducted by seven different observers (Appendix I), with the survey being performed as a secondary mission to oil spill reconnaissance. Numerous errors in marking exact nest locations on the maps had to be corrected during the later surveys. Grier et al. (1981) found no significant differences between observers while conducting similar surveys in Ontario; however, to minimize this possible variability in this year's survey, the same primary observer was used on all later survey flights.

Five additional nests were discovered between the June and July surveys, due primarily to the complexity of the coastal topography and limitations of aerial surveying. One such nest was located in a shallow cave, 10 m above mean high water. Fog, rain, and extremely low ceilings (< 70 m) were frequently encountered during surveys, limiting visibility.

Helicopters were used in all but the final two survey flights (Appendix I). The helicopter's ability to fly low, slow (60 knots), and hover proved to be a necessity given the coastal survey conditions. On the flights using the Cessna fixed-wing aircraft, nests and contents were very difficult to observe even with known locations, often necessitating much circling and numerous fly-bys.

The visibility of young varied over the observation period decreasing survey precision. Downy eaglets were observed to lay flat in the nest upon disturbance, increasing their camouflage against the nest materials. Older eaglets were observed to leave the nest, and hide in adjacent grass, giving the superficial appearance of an empty nest. Helicopter access often allowed ground checks, confirming the above observations. Due to their large size, the near-fledging eaglets were easiest to sight; however, early fledged individuals may have been missed.

Food habits

Incidental observations on food habits were made during the course of the nest survey. Salmon were the most frequently observed food type in the nests. In nest # 89-58, the remains of 6 black-legged kittiwakes (Rissa tridactyla) were found adjacent to the nest. On 19 June, four live, downy glaucous-winged gull (Larus glaucescens) chicks were observed nest # 89-8, along with one downy eaglet and one adult eagle. On the 4 July survey, only prey remains were observed in nest # 89-9, with one larger eaglet.

CONCLUSIONS

Even with the exhibited 50% nest failure rate, 57 eaglets were successfully produced from the 72 bald eagle nest sites recorded during the May-July 1989 survey. A minimum of 10 failed eggs was observed, with three eggs collected for further analysis. Lacking pre-oil spill eagle nest location data (Payne 1987), no comparison was possible.

RECOMMENDATIONS

- 1) This year's survey of the breeding population of bald eagles nesting between Cape Kubugakli and Cape Kumnik, along the Pacific coast of the Alaska Peninsula should be duplicated as close as possible for the 1990 production season. The main reason for survey replication would be to look for any continuing effects of the oil spill, such as oiled prey or a significant decrease in adult eagles or nests. Three helicopter surveys and one fixed wing surveys would be required to duplicate this year's effort. Below is a cost estimate for the 1990 survey:

Seven 8-hr helicopter use days (\$190/hr).....	\$10,640
Ten helicopter availability days (\$900/day).....	\$9,000
Ten days-helicopter pilot subsistence (\$54/day)...	\$ 540
Jet fuel - (6 drums @ \$300/drum incl. trans.).....	\$1,800
Ten hours- Cessna 206 (\$75/hr).....	\$ 750
Two days availability- Cessna 206 (\$76/day).....	\$ 152

Total \$22,882

- 2) Clearer guidelines are needed for egg collection procedures during future surveys.
- 3) If helicopter surveys are to be continued next year, we could gain more information by adding the following studies:
 - a) Check food items left in a random 25% of accessible nests during the downy and partially-feathered stage of young
 - b) Band accessible eaglets with a metal FWS leg band and a colored plastic leg band, if approved by the Regional Office/Patuxent Bird Banding Laboratory
- 4) Revise APNWR Wildlife Inventory Procedure for bald eagles to include a complete nest survey of the Refuges' Pacific coast.

LITERATURE CITED

- Bortolotti, G. R. 1986. Evolution of growth rates in eagles: sibling competition vs. energy considerations. *Ecology*. 67(1):182-194.
- Dewhurst, D. A. 1988. 1988 raptor study; the breeding bald eagle population, Amchitka Island, Alaska. U. S. Fish & Wildl. Serv., Admin. Rep. (Unpubl.). 11pp.
- Grier, J. W., J. M. Gerrard, G. D. Hamilton, P. A. Gray. 1981. Aerial-visibility bias and survey techniques for nesting bald eagles in Northwestern Ontario. *J. Wildl. Manage.* 45(1):83-92.
- King, J. G., F. C. Robards, and C. J. Lensink. 1972. Census of bald eagle breeding population of southeast Alaska. *J. Wildl. Manage.* 48:61-69.
- Murie, O. J. 1959. Fauna of the Aleutian Islands and the Alaska peninsula. U. S. Fish & Wildl. Serv., N. Amer. Fauna No. 61. U. S. Govt. Print. Office, Wash., D. C. 406pp.
- Payne, J. 1987. Initial bald eagle inventory along Pacific Coast. U. S. Fish & Wildl. Serv., Admin. Rep. (Unpubl) 4pp.
- Payne, J. 1988. Bald eagle population survey and nesting inventory, Alaska Peninsula/Becharof Natl. Wildl. Refuge. U. S. Fish & Wildl. Serv., Admin. Rep. (Unpubl) 4pp.
- Sherrod, S. K., C. M. White, and F. S. L. Williamson. 1977. Biology of the bald eagle on Amchitka Island, Alaska. *Living Bird*. 15:143-182.
- Sowl, L. W. 1982. A reconnaissance of the breeding distribution of colonial nesting of seabirds on the south coast of the Alaska Peninsula, May 30- June 19, 1973. U. S. Fish & Wildl. Serv., Admin. Rep. (Unpubl) 46pp.

Appendix I-- Dates, modes of transportation, and observers used during bald eagle nest surveys conducted 10 May- 25 July, 1989, Pacific Coast, Alaska Peninsula.

Date	Observers	Transport Mode **	Location Surveyed
5/10	Dewhurst*	H	Puale Bay
5/13	Dewhurst, Poetter	H	Cape Aklek- Cape Unalishagvak
5/13	Mumma, Arment	H	Cape Unalishagvak- Cape Igvak
5/14	Poetter, Hood	H	Cape Kubugakli- Alinchak Bay
6/01	Poetter, Sexaeur	H	Cape Igvak- Port Wrangell
6/03	Dewhurst, Hickey	H	Port Wrangell-Cape Kumnik
6/19	Dewhurst, Cook	H	Cape Kubugakli- Cape Kilokak
6/20	Dewhurst	H	Cape Kilokak- Cape Kumnik
7/04	Dewhurst, White	H	Cape Kubugakli- Cape Kilokak
7/05	Dewhurst, Peters	H	Cape Kilokak- Cape Kumnik
7/24	Dewhurst, Bassett	F	Cape Kumnik- Cape Kilokak
7/25	Dewhurst, Thomson	F	Cape Kilokak- Cape Kubugakli

* Observers' Full Names: Donna Dewhurst, Richard Poetter, Dwight Mumma, C. Randall Arment, Ronald Hood, Hilda Sexaeur, Michael Cook, Denise White, Ezekiel Peters, David Bassett, Gregory Thomson.

** Transport Mode: H = helicopter, F = fixed-wing

Appendix II-- Bald eagle nesting data gathered during May-July 1989 from Cape Kubugakli to Cape Kunmik, along the Pacific coast of the Alaska Peninsula.

Nest#	Location	Habitat Type*	Survey dates			
			5/**	6/19-21	7/4-5	7/24-25
89-1	Cape Kubugakli	I	N,2AI*	3YD	3YFF	2YFF
89-2	Alinchak Bay	I	N,2AI	2YD	2YFF	2YFF
89-3	Alinchak Bay	I	N,2AI	2YD,1E	2YFF,1E	2YFF
89-4	Alinchak Bay	IV	N,2AI	1YD	1YPF	1YFF
89-5	Alinchak Bay	I	N,1AI	NNO	NNO	NNO
89-6	Alinchak Bay	I	N,1AI	2YD	2YPF	2YFF
89-7	Cape Kekurnoi	II	N,2AI	NYO	NYO	NNO
89-8	Kekurnoi Islets	IV	N,2AI	1YD***	1YD	1YPF
89-9	Kekurnoi Islets	IV	N,2AI	1E	NYO	NNO
89-10	Puale Bay	V	NNO	NNO	1YPF	2YFF
89-11	Cape Aklek	V	NNO	1YPF***	1YPF	1YFF
89-12	Jute Island	IV	N,2AI	1E	NYO	NNO
89-13	Portage Bay	V	N,2AI	NNO	NNO	NNO
89-14	Kanatak Lagoon	I	N,2AI	NNO	NNO	NNO
89-15	Portage Bay	II	NNO	NNO	1YPF	1YFF
89-16	Cape Unalishagvak	II	N,2AI	1YD,1E	1YFF	1YFF
89-17	Cape Unalishagvak	III	N,2AI	1YD,1E	2YD	2YFF

* Sherrod et al. 1977, Dewhurst 1989 (Key on last page of Appendix II)

** Cape Kubugakli and Alinchak Bay- 5/14, Puale Bay- 5/10, Cape Aklek to Cape Unalishagvak- 5/13, Cape Unalishagvak to Cape Igvak- 5/13, Wide Bay to Port Wrangell- 6/1, Port Wrangell to Cape Kunmik- 6/3.

*** Nest# 89-8 - five downy glaucous-winged gull chicks in nest with eaglet on 6/19, Nest# 89-11 - nest located in shallow cave, approximately 9 m above sea level.

Appendix II (continued)-- Bald eagle nesting data gathered during May-July 1989 from Cape Kubugakli to Cape Kunmik, along the Pacific coast of the Alaska Peninsula.

Nest#	Location	Habitat Type	Survey dates			
			5-6/	6/19-21	7/4-5	7/24-25
89-18	Wide Bay-North	I	N,2AI	2YD	2YD	2YFF
89-19	East Channel Is.	IV	N,2AI	2YD	2YPF	2YFF
89-20	Coal Point	IV	N,1AI	1YD	1YPF	1YFF
89-21	Wide Bay-North	I	N,2AI	1YD	1YPF	1YFF
89-22	West Channel Is.	IV	N,2AI	2YD	2YPF	2YFF
89-23	Un-named Islet	IV	N,1AI	NNO*	NNO	NNO
89-24	Hartman Island	IV	N,1AI	1YD	1YPF	1YFF
89-25	Un-named Islet	IV	N,2AI	2YD	2YPF	2YFF
89-26	Un-named Islet	IV	N,1AI	1YD	1YFF	1YFF
89-27	Titcliff Island	IV	N,2AI	3YD	2YPF	3YFF
89-28	Cape Kayakliut	IV	N,2AI	NYO	NNO	NNO
89-29	Wide Bay-South	III	N,2AI	2YD	2YD	NYO
89-30	Imuya Bay	IV	N,2AI	2YD	2YD	2YPF
89-31	Imuya Bay	IV	N,2AI	2YD	2YD	2YFF
89-32	Imuya Bay	IV	N,2AI	2YD	1YD	1YFF
89-33	Imuya Bay	IV	N,2AI	NNO	NNO	NNO
89-34	Cape Kilokak	IV	N,2AI	1YD	1YFF	1YFF
89-35	Cape Kilokak	IV	N,2AI	NNO	NNO	NNO
89-36	Cape Kilokak	IV	N,1AI	1YD	1YPF	1YFF
89-37	Cape Kilokak	I	N,2AI	NYO	NYO	NNO
89-38	Cape Kilokak	IV	N,2AI	1YD	NYO	NNO

* Nest# 89-23 - nest destroyed by a brown bear, evidenced by digging mark and bear fur found at the nest site.

Appendix II (continued)-- Bald eagle nesting data gathered during May-July 1989 from Cape Kubugakli to Cape Kunmik, along the Pacific coast of the Alaska Peninsula.

Nest#	Location	Habitat Type	Survey dates			
			5-6/	6/19-21	7/4-5	7/24-25
89-39	Agripina Bay	IV N,2AI	2YD		2YPF	2YFF
89-40	Agripina Bay	V N,1AI	1YD		NYO	NNO
89-41	Agripina Bay	V N,2AI	1E		NYO	NYO
89-42	Agripina Bay	V N,2AI	1YD		NYO	NNO
89-43	Agripina Bay	IV N,2AI	1YD		1YPF	1YFF
89-44	Ashiiak Islet	IV NNO	N,2AI		NYO	NNO
89-45	W of Ashiiak Is.	IV NNO	NNO		2YPF	2YFF
89-46	Lone Rock	IV N,2AI	NYO		NYO	NNO
89-47	N of David Is.	I N,2AI	1YPF		1YFF	1YFF
89-48	David Island	IV N,2AI	NYO		NYO	NYO
89-49	David Island	IV NNO	NYO		1YD	NYO
89-50	Port Wrangell	I N,2AI	1YD		1YFF	1YFF
89-51	Port Wrangell	I 2E	1E		1YD	NYO
89-52	Port Wrangell	II NNO	NNO		2YPF	2YFF
89-53	Port Wrangell	II N,2AI	1YD,1E		1YPF	NYO
89-54	Poltava Island	IV N,2AI	--		--	--
89-55	Chiginagak Bay	IV 2A,1E	--		--	--
89-56	N of Derickson Is	IV 1A,1YD	--		--	--
89-57	Chiginagak Bay	IV 2A,2E	NYO		NNO	NNO
89-58	Chiginigak Bay	IV N,2AI	2YD,1E*		2YD	1YFF
89-59	Chiginigak Bay	I N,2AI	2YD		2YFF	2YFF

* 6/21 - One egg taken from nest for hydrocarbon testing, remains of 4+ kittiwakes found in nest

Appendix II (continued)-- Bald eagle nesting data gathered during May-July 1989 from Cape Kubugakli to Cape Kunmik, along the Pacific coast of the Alaska Peninsula.

Nest#	Location	Habitat Type	Survey dates			
			5-6/	6/19-21	7/4-5	7/24-25
89-60	Chiginigak Bay	I	N,2AI	2YD	2YFF	NYO
89-61	Cape Kuyuyukak	I	N,2AI	2YD	2YFF	2YFF
89-62	Central Island	IV	1YD	2YD	2YFF	2YFF
89-63	Ugaiushak Island	IV	N,2AI	--	NYO	--
89-64	Long Island	IV	1YD	1YD	2YFF	2YFF
89-65	Nakalilok Bay	III	N,2AI	2YD	2YD	2YFF
89-66	Nakalilok Bay	IV	N,2AI	NYO	NNO	NNO
89-67	Yantarni Sound	III	N,2AI	1E	NYO	NYO
89-68	Yantarni Bay	V	N,1AI	NYO	NNO	NNO
89-69	Yantarni Bay	V	N,2AI	1YD	NYO	NNO
89-70	Yantarni Bay	V	N,2AI	1YD	1YD	1YFF
89-71	Extra Islet	IV	N,1AI	2E	2E*	NYO
89-72	Cape Kunmik	II	N,2AI	NYO	NYO	NNO

* 7/5 - Two eggs collected from nest for hydrocarbon testing

Key: Habitat Types-- I = Sea Stack, II = Ridge/Coastal Cliff, III = Connected Stack, IV = Islet/Island, V = Hillside

Survey Abbreviations-- AI = Adult Incubating (2AI = 1 Adult Incubating with 1 Adult in Immediate Area), Y = Young/Eaglet, E = Egg, D = Downy, PF = Partially Feathered, FF = Fully Feathered/Flightless, NYO = No Young Observed, NNO = No Nest Observed, "--" = Nest not Surveyed, N = Nest Observed.