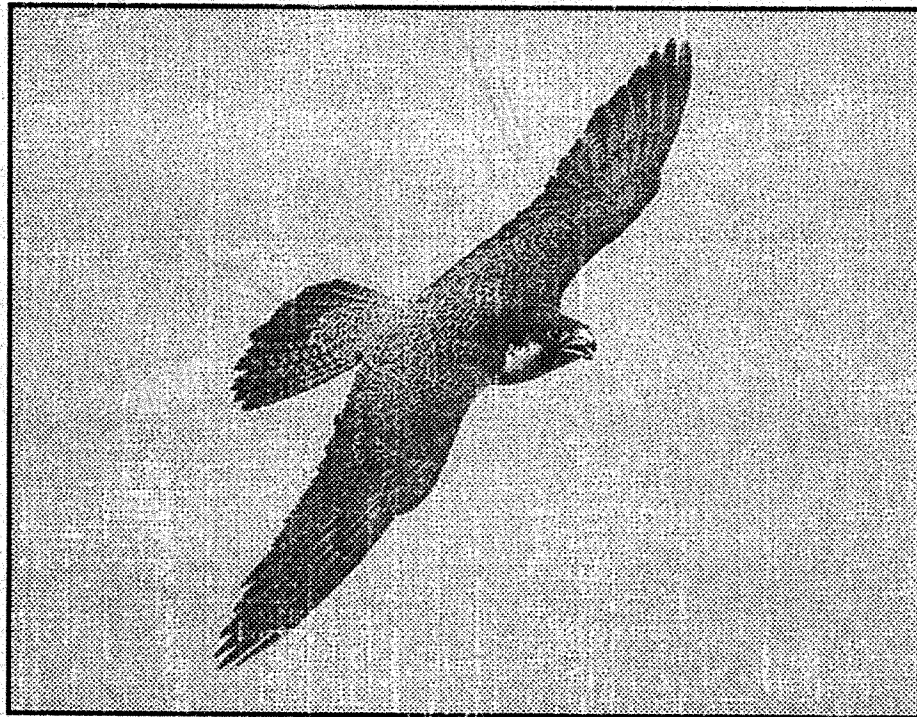


Surveys for American Peregrine Falcons In East-Central Alaska, 1995 and 1996



Reports Compiled By:

Skip Ambrose

Northern Alaska Ecological Services

Fish and Wildlife Service

101 12th Avenue, Room 110, Box 19

Fairbanks, Alaska 99701

May 1997

EXECUTIVE SUMMARY

American Peregrine Falcons In East-Central Alaska, 1996

The Fish and Wildlife Service and the Air Force have jointly monitored American peregrine falcons in east-central Alaska since 1993. In 1996, 265 km of the upper Yukon River, 114 km of the Charley River, 367 km of the Tanana River, and portions of the YUKON 1-5 MOAs were surveyed for American peregrine falcons and other raptors. One hundred and fifty-six occupied peregrine falcon nesting territories were located, and 137 pairs, 19 single adults, and 244 nestlings were observed. Breeding success (percent pairs successful) and productivity (nestlings per total pair) varied between the Yukon River study area (on-river) and YUKON 1 and 2 MOA study area (off-river) (63% to 56%, and 1.61 to 1.31, respectively). Flight restrictions of 2 miles horizontal distance and 2,000 feet above ground level were established along the Yukon, Charley, Kandik, and Porcupine rivers in 1993 to protect nesting peregrine falcons; those restrictions do not apply in the YUKON 1-5 MOAs off those rivers. Differences in breeding success and productivity between the on-river (protected) and off-river (unprotected) nesting territories may be due to low-level military aircraft. However, numerous environmental factors have the potential to influence breeding success and productivity of peregrine falcons, including weather, prey availability, habitat around the nest site, nest site characteristics, age of breeding adults, environmental contaminants, and density of breeding pairs. In order to assess the impacts and relative influence of low-level military aircraft on breeding success and productivity of peregrine falcons, all factors need to be evaluated. The Fish and Wildlife Service and the Air Force will continue to monitor the health of this population of peregrine falcons. We will also evaluate factors that influence breeding success and productivity, including low-level military aircraft, as funding allows.

The 156 occupied peregrine falcon nesting territories is the largest number in any one study area in North America. These nesting territories, occurring in relatively pristine environments, offer a unique opportunity for monitoring and assessing the impacts of low-level military aircraft. Portions of the study area are used for low-level military aircraft training while other areas are not. Comparisons of breeding success and productivity in disturbed and non-disturbed areas will help the Fish and Wildlife Service and the Air Force determine the impacts of low-level military aircraft on peregrine falcons.

Prepared by:
Northern Alaska Ecological Services
U.S. Fish and Wildlife Service
101 12th Avenue, Box 19
Fairbanks, AK 99701

Prepared for:
611 CES/CEVP
Eleventh Air Force
U.S. Air Force
Elmendorf Air Force Base, AK 99506

Introduction

The mission of the 11th Air Force is to maintain the security of and defend the United States against attack throughout the Pacific Theater. The mission is further defined to include offensive and defensive counter air, air interdiction, close air support and forward air control, suppression of enemy defenses, electronic combat, air refueling, and theater airlift (U.S. Air Force 1995). Two bases in Alaska, Elmendorf Air Force Base and Eielson Air Force Base, support the 11th Air Force mission. The 11th Air Force conducts flight training activities to assist in meeting its primary mission through well-trained, combat-ready tactical forces. Military Operations Areas (MOAs) in Alaska are used to conduct realistic air-to-air and air-to-ground training that includes air combat training, low-altitude training, and intercept training. Beginning in 1991, Air Force operations in Alaska changed substantially: the number of F-15 and F-16 aircraft stationed in Alaska increased; the size and number of Military Operations Areas (MOA), both permanent and temporary, were expanded; the number of annual training missions increased; and the number of annual major flying exercises increased. These changes have resulted in a significant increase in low-level military aircraft activity in Alaska. Low-level military aircraft have the potential to negatively impact wildlife populations, and the Air Force has undertaken studies to determine impacts to wildlife in Alaska.

American peregrine falcons are medium-sized raptors that prey almost entirely on birds. Their range extends from Mexico north to the tree-line in Canada and Alaska. In Alaska, they occur in the forested interior, nesting primarily along the major rivers. In the northern parts of its range, the American peregrine falcon is highly migratory, wintering as far south as Brazil and Argentina. Beginning in the late 1940s, the use of persistent organochlorine pesticides greatly affected American peregrine falcons in North America. These pesticides affected mortality and behavior, and caused birds to lay thin-shelled eggs that often failed to hatch and consequently lowered reproduction. This species was classified as "endangered" in 1973 under the Endangered Species Act. In Alaska, local populations declined to approximately 20 percent of historical levels by the mid-1970s. In 1972, the United States restricted the use of persistent organochlorine pesticides, and local populations in Alaska began to increase in 1978 and have continued to do so.

The U.S. Fish and Wildlife Service is the federal agency responsible for administration of the Endangered Species Act (Act) of 1973, as amended. The Service has worked with the Air Force on several Section 7 Consultations on military activity in Alaska and the potential impacts to threatened and endangered species. All federal agencies are directed under Section 7(a)(1) of the Act to utilize their authorities to recover listed species. The Service, in cooperation with other federal and state agencies, has been working on monitoring and recovery programs for peregrine falcons in Alaska since 1977.

In March 1993, the Service and the Air Force concluded formal consultation regarding proposed changes in the Air Force's aircraft training operations in Alaska. In a March 31, 1993, Biological Opinion, the Service concluded that some incidental take of American peregrine falcons would likely result from low-level training operations. The Air Force concurred with that opinion, and agreed to establish aircraft exclusion zones around the following river corridors where peregrine falcons nest at high density: upper Yukon River (between Circle, Alaska and the Alaska-Yukon Territory border), Charley River, Kandik River, and Porcupine River. These exclusion zones require that the Air Force avoid these areas by flying at least 2 miles horizontal distance or at least 2,000 feet above ground level (AGL). When the incidental take of a listed species is expected, the level of incidental take anticipated must be identified and monitored. If the anticipated level of incidental take is exceeded, consultation must be reinitiated. Following the March 31, 1993, Biological Opinion, the Air Force and the Service agreed to monitor incidental take of American peregrine falcons and a survey was initiated that year.

This report summarizes results of surveys conducted in east-central Alaska, primarily in the YUKON 1-5 Military Operations Areas (MOA) and along the Yukon, Charley, and Tanana rivers in 1996. Data collected in the years 1992-1995 are included. In addition, recommendations for a long-term monitoring program are presented.

Objectives

The objectives of the peregrine falcon survey program were to:

1. Locate and monitor nesting territory occupancy, breeding success, and productivity of American peregrine falcons in the YUKON 1-5 MOAs; and
2. Locate an adequate number of nesting territories in both on-river and off-river areas (with and without flight restriction zones) for long-term monitoring efforts.

Study Area

The study area was that portion of east-central Alaska bordered by the Porcupine River on the north, the United States-Canada border on the east, and the Tanana River on the south and east (Figure 1). This area is influenced by a continental climate and contains a mix of broadleaf and conifer vegetation communities and is commonly referred to as the boreal forest. Along the major rivers, cottonwood (*P. spp.*), balsam poplar (*P. Balsamifera*), and white and black spruce (*Picea spp.*) forests, medium and tall shrub thickets (primarily dominated by various *Salix spp.*), and sparsely vegetated gravel bars dominate.

Methods

Surveys were conducted using river boats, inflatable rafts, fixed-wing aircraft, and rotor-wing aircraft. Nesting territories were noted on U.S. Geological Survey topographic maps, and nest occupancy data and nest site characteristics were entered onto Alaska Raptor Observation Record Cards. Narrative descriptions of behavior, nest site locations, and other observations were kept in field notebooks. Terminology and definitions followed that described in the National Wildlife Federation's Raptor Management Techniques Manual (1986).

The following information was collected:

1. The number of nesting territories occupied by a pair;
2. The number of nesting territories occupied by a single adult;
3. The number of pairs attempting to breed;
4. The number of pairs with nestlings; and
5. The number of nestlings reaching 10 days of age or more.

Results

During the years 1993-1996, most of the YUKON 1-5 MOAs were surveyed for peregrine falcons. A total of 210 nesting territories were identified in the entire study area, 72 of these were along major river corridors (Yukon, Charley, and Kandik rivers), and 138 in areas outside the river corridors (Table 1). In 1996, 137 pairs, 19 single adults, and 244 nestlings were observed. Reports on 1995 and 1996 surveys along the Yukon River (Ambrose 1995 and 1996), the Charley River (McIntyre and Hander 1995, McIntyre 1996), and the YUKON 1-5 MOAs, including the Tanana River (Ritchie and Rose 1995 and 1996), are attached.

Discussion

The extensive survey efforts of the past four years located a large number of peregrine falcon nesting territories in the YUKON 1-5 MOAs. The 156 occupied nesting territories (137 pairs and 19 single adults) located in 1996 is the highest number of occupied peregrine falcon nesting territories recorded in any study area in North America. Of this total, there are adequate numbers in both "on-river" areas (protected with flight restrictions) and "off-river" areas (unprotected, without flight restrictions) to begin a long-term monitoring and comparative study. In 1996 along the Yukon River (a protected area), 41 nesting territories were occupied by pairs. In the YUKON 1 and 2 MOAs (an unprotected area) in 1996, 29 nesting territories were occupied by pairs. Breeding success and productivity were higher in the protected area (63% and 1.61 young per pair) than in the unprotected area (55% and 1.31 young per pair) (Table 2). Although the differences were not statistically significant, the lack of significance was most likely due

to low sample sizes. Similar values over several years would be significantly different. The Air Force and the Fish and Wildlife Service plan to continue surveys in these areas to determine differences in breeding success and productivity in the protected versus unprotected areas.

With this large number of occupied nesting territories in a relatively pristine environment, we have a unique opportunity to monitor the health of this local population with few outside influences and to investigate the long-term influences of low-level military aircraft on peregrine falcons.

Although low-level military aircraft have the potential to disturb peregrine falcons nesting in the MOAs, several other factors also have the potential to influence breeding success and productivity. These include nest site characteristics, weather, prey availability, habitat around nest sites, breeding density, environmental contaminants, and age of breeding adults. In-depth assessment of all factors influencing breeding success and productivity of peregrine falcons is needed to evaluate the relative influence of low-level military aircraft. Such assessment is beyond the scope of this project.

Recommendations

Extensive surveys in 1993-1996 located two distinct areas with a large number of peregrine falcon nesting territories suitable for long-term monitoring. These areas are distinct both geographically and relative to flight restrictions around the nest sites. The two areas are the on-river area along the upper Yukon River between the Alaska-Canada border and Circle, Alaska, and the off-river areas in the YUKON 1 and 2 MOAs. Specific descriptions of these areas are in the attached reports by Ambrose (1996) and Ritchie and Rose (1997). Flight restrictions (2,000 feet AGL and 2 miles horizontal distance) were established along the upper Yukon River as a result of the March 31, 1993, Biological Opinion. No such restrictions are currently in place for those nesting territories in YUKON 1 and 2 MOAs outside the Yukon and Charley rivers.

The Fish and Wildlife Service and the Air Force intend to monitor peregrine falcon nesting territories along the upper Yukon River and in the YUKON MOAs as long as the species is listed and for a five period following delisting. The purposes of the monitoring effort will be to insure that the health of these populations continue to improve and also to determine the long-term impacts of low-level military aircraft on nesting peregrine falcons. Occupancy, breeding success, and productivity will be monitored at all known nesting territories in the two study areas, and results will be compared.

Other factors that influence nest territory occupancy, breeding success, and productivity should be evaluated in order to more accurately assess the impacts and relative importance of low-level military aircraft on peregrine falcons. These factors include nest site characteristics, weather, environmental contaminants, habitat around the nest site,

prey availability, and age of breeding adults.

Noise levels, including sonic booms, should be monitored at selected locations in both on- and off-river areas. This information is necessary to determine the effectiveness of flight restrictions currently in place for on-river areas, and to determine if differences in noise levels and the number of sonic booms are related to nest site occupancy, breeding success, and productivity.

Summary of recommendations:

1. Monitor peregrine falcon nest territory occupancy, breeding success, and productivity along the upper Yukon River and in the YUKON MOAs for as long as the species is listed and for a five year period following delisting;
2. Compare differences in nest territory occupancy, breeding success, and productivity between the upper Yukon River study area and the YUKON 1 and 2 MOAs study area;
3. Evaluate all factors, including low-level aircraft and supersonic flight, that have the potential to influence nesting territory occupancy, breeding success, and productivity of American peregrine falcons;
5. Monitor noise levels and sonic booms at nest sites along the upper Yukon River and in the YUKON 1 and 2 MOAs; and
6. Compare noise levels with occupancy, breeding success and productivity;

Acknowledgments

Mr. James Hostman, 11th Air Force, Elmendorf Air Force Base, Alaska, was responsible for securing the majority of funding for these surveys. Additional funding sources were: 354th Fighter Wing, Eielson Air Force Base, Alaska; Noise and Sonic Boom Impact Technology Division, Wright-Patterson Air Force Base, Ohio; Division of Endangered Species, U.S. Fish and Wildlife Service, Fairbanks, Alaska; and Yukon-Charley Rivers National Preserve, National Park Service, Fairbanks, Alaska. Investigators included Skip Ambrose, Fish and Wildlife Service; Carol McIntyre, National Park Service; and Robert Ritchie and John Rose, ABR, Inc., Fairbanks.

Literature Cited

- Ambrose, S. 1996. American Peregrine Falcons Along the Upper Yukon River, Alaska, 1996. Unpublished report to the 354th Fighter Wing, Eielson Air Force Base, Alaska. 14 pp.
- McIntyre, C.L. 1996. Charley River Peregrine Falcon (*Falco peregrinus*) Survey, 1996. Unpublished report to the U.S. Fish and Wildlife Service, Endangered Species, Fairbanks, Alaska. 6 pp.
- National Wildlife Federation. 1987. Raptor Management Techniques Manual (B.A. Giron Pendleton, B.A. Millsap, K. W. Cline, and D. M. Bird, Eds.). National Wildlife Federation, Washington, D.C. 420 pp.
- Ritchie, R.J. and J. Rose. 1997. Results of Raptor Surveys on the Tanana River and in YUKON MOAs 1-5, Alaska, 1996. Unpublished report to the U.S. Fish and Wildlife Service, Endangered Species, Fairbanks, Alaska. 24 pp.
- United States Air Force. 1995. Executive Summary, Final Environmental Impact Statement, Alaska Military Operations Areas. 11th Air Force, Elmendorf A.F. B., AK. 34 pp.

Figure 1. Locations of American peregrine falcon nest sites in YUKON 1-5 Military Operations Areas and Tanana River, Alaska.

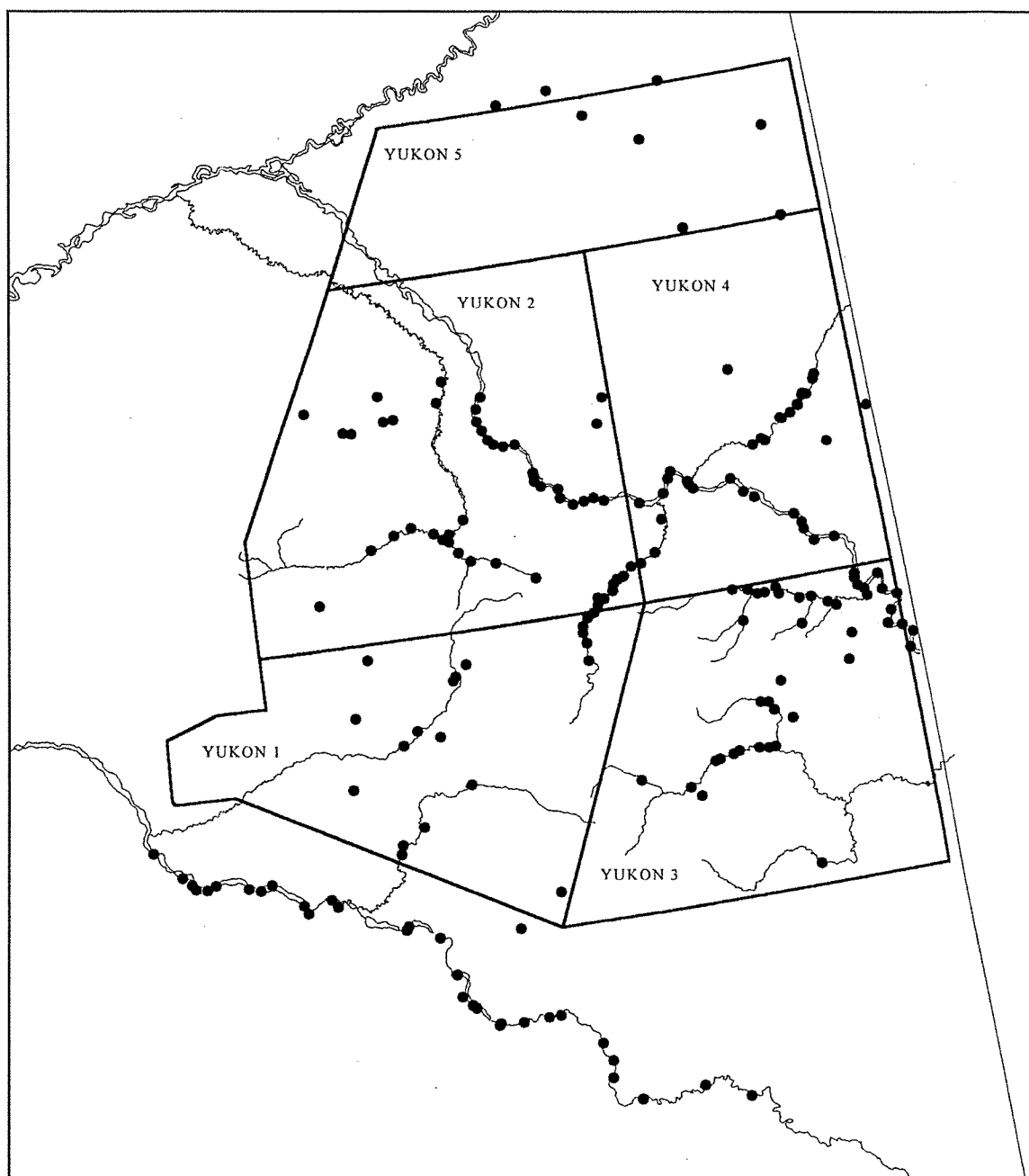


Table 1. American peregrine falcon nest sites in YUKON 1-5 MOAs and the Tanana River, Alaska, 1993-1996.

SOURCE	AREA	YEAR	OTHERNUM	LAT	LONG
Ambrose 1996	Upper Yukon River	96	YUKO003.5	64.7086	141.0635
Ambrose 1996	Upper Yukon River	96	YUKO009.5	64.7584	141.0202
Ambrose 1996	Upper Yukon River	96	YUKO014.5	64.7845	141.0941
Ambrose 1996	Upper Yukon River	96	YUKO020.0	64.7985	141.1983
Ambrose 1996	Upper Yukon River	96	YUKO025.0	64.8395	141.1521
Ambrose 1996	Upper Yukon River	96	YUKO032.0	64.8864	141.0872
Ambrose 1996	Upper Yukon River	96	YUKO038.0	64.9119	141.1916
Ambrose 1996	Upper Yukon River	96	YUKO044.5	64.9626	141.1998
Ambrose 1996	Upper Yukon River	96	YUKO052.0	64.9240	141.3266
Ambrose 1996	Upper Yukon River	96	YUKO054.0	64.9394	141.3696
Ambrose 1996	Upper Yukon River	96	YUKO056.0	64.9636	141.3828
Ambrose 1996	Upper Yukon River	96	YUKO057.5	64.9773	141.3754
Ambrose 1996	Upper Yukon River	96	YUKO076.5	65.1102	141.4744
Ambrose 1996	Upper Yukon River	96	YUKO083.0	65.1089	141.6285
Ambrose 1996	Upper Yukon River	96	YUKO088.0	65.1517	141.6898
Ambrose 1996	Upper Yukon River	96	YUKO090.5	65.1735	141.6987
Ambrose 1996	Upper Yukon River	96	YUKO095.0	65.2063	141.7440
Ambrose 1996	Upper Yukon River	96	YUKO112.0	65.2816	142.0190
Ambrose 1996	Upper Yukon River	96	YUKO117.0	65.3054	142.0949
Ambrose 1996	Upper Yukon River	96	YUKO124.0	65.3539	142.1762
Ambrose 1996	Upper Yukon River	96	YUKO138.0	65.3440	142.4798
Ambrose 1996	Upper Yukon River	96	YUKO140.0	65.3575	142.5000
Ambrose 1996	Upper Yukon River	96	YUKO141.5	65.3700	142.5100
Ambrose 1996	Upper Yukon River	96	YUKO148.0	65.4100	142.6300
Ambrose 1996	Upper Yukon River	96	YUKO149.5	65.3899	142.6576
Ambrose 1996	Upper Yukon River	96	YUKO155.5	65.3447	142.7122
Ambrose 1996	Upper Yukon River	96	YUKO166.0	65.3269	142.9077
Ambrose 1996	Upper Yukon River	96	YUKO180.0	65.3541	143.1753
Ambrose 1996	Upper Yukon River	96	YUKO183.0	65.3668	143.2502
Ambrose 1996	Upper Yukon River	96	YUKO187.0	65.3619	143.3278
Ambrose 1996	Upper Yukon River	96	YUKO191.5	65.3564	143.4171
Ambrose 1996	Upper Yukon River	96	YUKO196.0	65.3842	143.5088
Ambrose 1996	Upper Yukon River	96	YUKO199.0	65.4141	143.5151
Ambrose 1996	Upper Yukon River	96	YUKO205.5	65.4322	143.6437
Ambrose 1996	Upper Yukon River	96	YUKO208.5	65.4524	143.6890
Ambrose 1996	Upper Yukon River	96	YUKO210.5	65.4690	143.6883
Ambrose 1996	Upper Yukon River	96	YUKO211.5	65.4790	143.6856
Ambrose 1996	Upper Yukon River	96	YUKO224.5	65.5800	143.7939

Ambrose 1996	Upper Yukon River	96	YUKO229.0	65.5793	143.8861
Ambrose 1996	Upper Yukon River	96	YUKO233.0	65.5893	143.9586
Ambrose 1996	Upper Yukon River	96	YUKO235.0	65.6070	143.9964
Ambrose 1996	Upper Yukon River	96	YUKO239.5	65.6407	144.0341
Ambrose 1996	Upper Yukon River	96	YUKO243.5	65.6726	144.0622
Ambrose 1996	Upper Yukon River	96	YUKO249.0	65.7148	144.0503
Ambrose 1996	Upper Yukon River	96	YUKO254.0	65.7517	144.0027
Fadely and Fadely 1993	Kandik River	93	KAND039.5	65.6447	141.3814
Fadely and Fadely 1993	Kandik River	93	KAND041.7	65.6289	141.3994
Fadely and Fadely 1993	Kandik River	93	KAND049.7	65.5856	141.4711
Fadely and Fadely 1993	Kandik River	93	KAND051.2	65.5903	141.4992
Fadely and Fadely 1993	Kandik River	93	KAND059.4	65.5528	141.5519
Fadely and Fadely 1993	Kandik River	93	KAND065.7	65.5336	141.6203
Fadely and Fadely 1993	Kandik River	93	KAND071.7	65.5194	141.6936
Fadely and Fadely 1993	Kandik River	93	KAND084.4	65.4581	141.8542
Fadely and Fadely 1993	Kandik River	93	KAND089.9	65.4661	141.8831
Fadely and Fadely 1993	Kandik River	93	KAND095.0	65.4511	141.9578
McIntyre 1996	Charley River	96	CHAR011.5	65.2630	142.7580
McIntyre 1996	Charley River	96	CHAR030.0	65.1580	142.8530
McIntyre 1996	Charley River	96	CHAR042.5	65.1310	142.9740
McIntyre 1996	Charley River	96	CHAR048	65.1250	143.0540
McIntyre 1996	Charley River	96	CHAR058	65.1000	143.1250
McIntyre 1996	Charley River	96	CHAR063	65.0920	143.1790
McIntyre 1996	Charley River	96	CHAR066	65.0780	143.2140
McIntyre 1996	Charley River	96	CHAR069	65.0580	143.2250
McIntyre 1996	Charley River	96	CHAR073	65.0370	143.2970
McIntyre 1996	Charley River	96	CHAR076	65.0420	143.3470
McIntyre 1996	Charley River	96	CHAR081	65.0190	143.3570
McIntyre 1996	Charley River	96	CHAR087	64.9960	143.3970
McIntyre 1996	Charley River	96	CHAR091	64.9830	143.4500
McIntyre 1996	Charley River	96	CHAR097	64.9580	143.4970
McIntyre 1996	Charley River	96	CHAR099	64.9380	143.5030
McIntyre 1996	Charley River	96	CHAR103.0	64.9030	143.4830
McIntyre 1996	Charley River	96	CHAR110.0	64.8460	143.4920
Ritchie and Rose 1996	Salcha	93	1002	64.9500	145.1725
Ritchie and Rose 1996	Salcha	93	1003	64.8590	144.5168
Ritchie and Rose 1996	Birch Ck	93	2008	65.2230	144.2740
Ritchie and Rose 1996	Birch Ck	93	2009	65.2558	144.3583
Ritchie and Rose 1996	Salcha	94	1001	64.7667	145.3232
Ritchie and Rose 1996	Salcha	94	1004	64.6582	144.9862
Ritchie and Rose 1996	Salcha	94	1005	64.6717	144.7000
Ritchie and Rose 1996	Goodpaster	94	1006	64.3378	145.0927

Ritchie and Rose 1996	Goodpaster	94	1007	64.3087	145.1112
Ritchie and Rose 1996	Birch Ck	94	2001	65.8202	144.2918
Ritchie and Rose 1996	Birch Ck	94	2002	65.7540	144.3570
Ritchie and Rose 1996	Birch Ck	94	2003	65.3627	144.2847
Ritchie and Rose 1996	Birch Ck	94	2004	65.3207	144.4118
Ritchie and Rose 1996	Birch Ck	94	2005	65.3427	144.8412
Ritchie and Rose 1996	Birch Ck	94	2006	65.3073	144.4652
Ritchie and Rose 1996	Birch Ck	94	2007	65.3293	144.5317
Ritchie and Rose 1996	Black R	94	2010	65.6900	143.0507
Ritchie and Rose 1996	Seventy Mi	94	3001	64.9000	141.3083
Ritchie and Rose 1996	Seventy Mi	94	3002	64.9030	141.6148
Ritchie and Rose 1996	Seventy Mi	94	3003	64.9303	141.7340
Ritchie and Rose 1996	Seventy Mi	94	3004	64.9862	142.2008
Ritchie and Rose 1996	Seventy Mi	94	3005	64.9963	142.3173
Ritchie and Rose 1996	Seventy Mi	94	3006	64.8913	142.2802
Ritchie and Rose 1996	Forty Mile	94	3007	64.4345	143.2422
Ritchie and Rose 1996	Forty Mile	94	3008	64.6158	142.2008
Ritchie and Rose 1996	Forty Mile	94	3009	64.0710	142.0167
Ritchie and Rose 1996	Seventy Mi	94	3010	64.7072	141.5402
Ritchie and Rose 1996	Black	94	4006	66.1878	142.1862
Ritchie and Rose 1996	Black	94	5001	66.6772	142.1707
Ritchie and Rose 1996	Black	94	5002	66.4958	142.4033
Ritchie and Rose 1996	Black	94	5003	66.6053	142.8273
Ritchie and Rose 1996	Black	94	5004	66.7058	143.0845
Ritchie and Rose 1996	Black	94	5005	66.6843	143.5055
Ritchie and Rose 1996	Salcha	95	1001	64.7667	145.3232
Ritchie and Rose 1996	Salcha	95	1004	64.6582	144.9862
Ritchie and Rose 1996	Salcha	95	1005	64.6717	144.7000
Ritchie and Rose 1996	Goodpaster	95	1007	64.3087	145.1112
Ritchie and Rose 1996	Salcha	95	1008	64.8932	144.4283
Ritchie and Rose 1996	Salcha	95	1009	64.7010	144.8713
Ritchie and Rose 1996	Salcha	95	1010	64.5370	145.4097
Ritchie and Rose 1996	Salcha	95	1021	64.8463	144.5425
Ritchie and Rose 1996	Birch Ck	95	2001	65.8202	144.2918
Ritchie and Rose 1996	Birch Ck	95	2002	65.7540	144.3570
Ritchie and Rose 1996	Birch Ck	95	2003	65.3627	144.2847
Ritchie and Rose 1996	Birch Ck	95	2004	65.3207	144.4118
Ritchie and Rose 1996	Birch Ck	95	2005	65.3427	144.8412
Ritchie and Rose 1996	Birch Ck	95	2007	65.3293	144.5317
Ritchie and Rose 1996	Birch Ck	95	2008	65.2230	144.2740
Ritchie and Rose 1996	Birch Ck	95	2009	65.2558	144.3583
Ritchie and Rose 1996	Birch Ck	95	2016	65.3037	145.0283

Ritchie and Rose 1996	Seventy Mi	95	3002	64.9030	141.6148
Ritchie and Rose 1996	Seventy Mi	95	3003	64.9303	141.7340
Ritchie and Rose 1996	Seventy Mi	95	3004	64.9862	142.2008
Ritchie and Rose 1996	Seventy Mi	95	3005	64.9963	142.3173
Ritchie and Rose 1996	Seventy Mi	95	3006	64.8913	142.2802
Ritchie and Rose 1996	Forty Mile	95	3007	64.4345	143.2422
Ritchie and Rose 1996	Forty Mile	95	3008	64.6158	142.2008
Ritchie and Rose 1996	Forty Mile	95	3009	64.0710	142.0167
Ritchie and Rose 1996	Seventy Mi	95	3010	64.7072	141.5402
Ritchie and Rose 1996	Seventy Mi	95	3022	64.9317	141.8268
Ritchie and Rose 1996	Seventy Mi	95	3023	64.9790	141.9902
Ritchie and Rose 1996	Seventy Mi	95	3024	64.8483	141.8393
Ritchie and Rose 1996	Seventy Mi	95	3025	64.8867	141.5568
Ritchie and Rose 1996	Forty Mile	95	3027	64.4698	142.2568
Ritchie and Rose 1996	Forty Mile	95	3028	64.4690	142.5268
Ritchie and Rose 1996	Forty Mile	95	3029	64.4592	142.6365
Ritchie and Rose 1996	Forty Mile	95	3030	64.4572	142.6678
Ritchie and Rose 1996	Forty Mile	95	3031	64.3518	142.8158
Ritchie and Rose 1996	Forty Mile	95	3032	64.3862	142.8862
Ritchie and Rose 1996	Seventy Mi	95	3033	64.9700	142.0793
Ritchie and Rose 1996	Nation	95	4001	65.5133	141.0258
Ritchie and Rose 1996	Nation	95	4002	65.4202	141.3855
Ritchie and Rose 1996	Kandik	95	4003	65.5227	141.7100
Ritchie and Rose 1996	Kandik	95	4004	65.5562	141.5535
Ritchie and Rose 1996	Nation	95	4005	65.5847	141.5075
Ritchie and Rose 1996	Salcha	96	1001	64.7667	145.3232
Ritchie and Rose 1996	Salcha	96	1003	64.8590	144.5168
Ritchie and Rose 1996	Salcha	96	1004	64.6582	144.9862
Ritchie and Rose 1996	Salcha	96	1005	64.6717	144.7000
Ritchie and Rose 1996	Goodpaster	96	1006	64.3378	145.0927
Ritchie and Rose 1996	Goodpaster	96	1007	64.3087	145.1112
Ritchie and Rose 1996	Salcha	96	1008	64.8932	144.4283
Ritchie and Rose 1996	Salcha	96	1009	64.7010	144.8713
Ritchie and Rose 1996	Healy	96	1040	64.0152	144.3012
Ritchie and Rose 1996	Healy	96	1041	64.1150	143.9675
Ritchie and Rose 1996	Goodpaster	96	1043	64.5042	144.5167
Ritchie and Rose 1996	Goodpaster	96	1049	64.3867	144.9157
Ritchie and Rose 1996	Birch Ck	96	2001	65.8202	144.2918
Ritchie and Rose 1996	Birch Ck	96	2002	65.7540	144.3570
Ritchie and Rose 1996	Birch Ck	96	2003	65.3627	144.2847
Ritchie and Rose 1996	Birch Ck	96	2004	65.3207	144.4118
Ritchie and Rose 1996	Birch Ck	96	2005	65.3427	144.8412

Ritchie and Rose 1996	Birch Ck	96	2006	65.3073	144.4652
Ritchie and Rose 1996	Birch Ck	96	2007	65.3293	144.5317
Ritchie and Rose 1996	Birch Ck	96	2008	65.2230	144.2740
Ritchie and Rose 1996	Birch Ck	96	2009	65.2558	144.3583
Ritchie and Rose 1996	Black R	96	2010	65.6900	143.0507
Ritchie and Rose 1996	Birch Ck	96	2016	65.3037	145.0283
Ritchie and Rose 1996	Birch Ck	96	2023	65.7175	144.7135
Ritchie and Rose 1996	Birch Ck	96	2024	65.7155	144.7895
Ritchie and Rose 1996	Birch Ck	96	2025	65.8015	144.8070
Ritchie and Rose 1996	Birch Ck	96	2026	65.7765	145.4067
Ritchie and Rose 1996	Birch Ck	96	2027	65.6968	145.1207
Ritchie and Rose 1996	Birch Ck	96	2028	65.6922	145.0565
Ritchie and Rose 1996	Birch Ck	96	2029	65.1453	145.4850
Ritchie and Rose 1996	Birch Ck	96	2030	65.3585	144.6950
Ritchie and Rose 1996	SF Birch Ck	96	2032	65.2953	144.4213
Ritchie and Rose 1996	SF Birch Ck	96	2033	65.2045	144.0837
Ritchie and Rose 1996	SF Birch Ck	96	2034	65.1377	143.7963
Ritchie and Rose 1996	Black	96	2038	65.6058	143.1277
Ritchie and Rose 1996	Seventy Mi	96	3002	64.9030	141.6148
Ritchie and Rose 1996	Seventy Mi	96	3003	64.9303	141.7340
Ritchie and Rose 1996	Seventy Mi	96	3004	64.9862	142.2008
Ritchie and Rose 1996	Seventy Mi	96	3005	64.9963	142.3173
Ritchie and Rose 1996	Seventy Mi	96	3006	64.8913	142.2802
Ritchie and Rose 1996	Forty Mile	96	3007	64.4345	143.2422
Ritchie and Rose 1996	Forty Mile	96	3009	64.0710	142.0167
Ritchie and Rose 1996	Seventy Mi	96	3010	64.7072	141.5402
Ritchie and Rose 1996	Seventy Mi	96	3022	64.9317	141.8268
Ritchie and Rose 1996	Seventy Mi	96	3024	64.8483	141.8393
Ritchie and Rose 1996	Seventy Mi	96	3025	64.8867	141.5568
Ritchie and Rose 1996	Forty Mile	96	3027	64.4698	142.2568
Ritchie and Rose 1996	Forty Mile	96	3030	64.4572	142.6678
Ritchie and Rose 1996	Forty Mile	96	3032	64.3862	142.8862
Ritchie and Rose 1996	Seventy Mi	96	3045	64.9568	141.9765
Ritchie and Rose 1996	Seventy Mi	96	3046	64.7902	141.4812
Ritchie and Rose 1996	Forty Mile	96	3049	64.4700	142.2042
Ritchie and Rose 1996	Forty Mile	96	3050	64.5537	142.0367
Ritchie and Rose 1996	Forty Mile	96	3051	64.5890	142.1648
Ritchie and Rose 1996	Forty Mile	96	3052	64.6210	142.2573
Ritchie and Rose 1996	Forty Mile	96	3054	64.4757	142.3275
Ritchie and Rose 1996	Forty Mile	96	3058	64.6773	142.0782
Ritchie and Rose 1996	Forty Mile	96	3059	64.4763	142.4807
Ritchie and Rose 1996	Seventy Mi	96	3060	64.9695	142.1342

Ritchie and Rose 1996	Black	96	4006	66.1878	142.1862
Ritchie and Rose 1996	Black	96	4010	66.1718	141.3962
Ritchie and Rose 1996	Black	96	4011	65.7072	142.0388
Ritchie and Rose 1996	Black	96	5042	66.4722	141.4087
Ritchie and Rose 1996	Tanana River	96	TANA103.0	63.3650	142.8222
Ritchie and Rose 1996	Tanana River	96	TANA135.0	63.4235	143.1387
Ritchie and Rose 1996	Tanana River	96	TANA181.0	63.4097	143.6013
Ritchie and Rose 1996	Tanana River	96	TANA205.0	63.4938	143.7883
Ritchie and Rose 1996	Tanana River	96	TANA211.0	63.5482	143.7738
Ritchie and Rose 1996	Tanana River	96	TANA221.5	63.6097	143.8250
Ritchie and Rose 1996	Tanana River	96	TANA243.0	63.7203	144.1043
Ritchie and Rose 1996	Tanana River	96	TANA244.5	63.7213	144.5508
Ritchie and Rose 1996	Tanana River	96	TANA247.0	63.7138	144.3783
Ritchie and Rose 1996	Tanana River	96	TANA258.5	63.7198	144.1902
Ritchie and Rose 1996	Tanana River	96	TANA269.5	63.7162	144.5620
Ritchie and Rose 1996	Tanana River	96	TANA280.5	63.7822	144.7103
Ritchie and Rose 1996	Tanana River	96	TANA282.0	63.7922	144.7367
Ritchie and Rose 1996	Tanana River	96	TANA288.5	63.8228	144.8048
Ritchie and Rose 1996	Tanana River	96	TANA299.0	63.8967	144.8190
Ritchie and Rose 1996	Tanana River	96	TANA320.0	64.0222	144.9113
Ritchie and Rose 1996	Tanana River	96	TANA335.0	64.0725	145.1328
Ritchie and Rose 1996	Tanana River	96	TANA336.5	64.0612	145.1467
Ritchie and Rose 1996	Tanana River	96	TANA371.0	64.1663	145.6357
Ritchie and Rose 1996	Tanana River	96	TANA376.0	64.1912	145.6763
Ritchie and Rose 1996	Tanana River	96	TANA380.0	64.1833	145.8880
Ritchie and Rose 1996	Tanana River	96	TANA386.0	64.1572	145.8592
Ritchie and Rose 1996	Tanana River	96	TANA405.0	64.2620	146.1073
Ritchie and Rose 1996	Tanana River	96	TANA408.0	64.2477	146.1958
Ritchie and Rose 1996	Tanana River	96	TANA414.5	64.2588	146.2840
Ritchie and Rose 1996	Tanana River	96	TANA427.0	64.2815	146.5253
Ritchie and Rose 1996	Tanana River	96	TANA431.0	64.2690	146.5947
Ritchie and Rose 1996	Tanana River	96	TANA436.5	64.2765	146.6800
Ritchie and Rose 1996	Tanana River	96	TANA438.5	64.2925	146.7013
Ritchie and Rose 1996	Tanana River	96	TANA443.0	64.3178	146.7693
Ritchie and Rose 1996	Tanana River	96	TANA459.5	64.4077	146.9667

Table 2. American Peregrine Falcons in the On-River (Yukon River) and Off-River (YUKON 1 and 2 MOAs) Areas, 1996.

	On River (Yukon River)	Off-River (Yukon 1 & 2 MOA)
Pairs:	41	29
Successful Pairs:	26	16
Percent Pairs Succ.:	63%	55%
Nestlings:	66	38
Nestlings/Total Pair:	1.61	1.31
Nestlings//Succ. Pair:	2.54	2.38

Nestlings: A young falcon 10 or more days old

Successful Pairs: Pairs having at least 1 nestling 10 or more days old.

American Peregrine Falcons Along the Upper Yukon River, Alaska, 1996

**Skip Ambrose
Endangered Species
U.S. Fish and Wildlife Service
101 12th Avenue, Room 110, Box 19
Fairbanks, AK 99701**

December 1996



**354th Fighter Wing
Eleventh Air Force
U.S. Air Force
Eielson Air Force Base, AK**



**Endangered Species
Northern Alaska Ecological Services
U.S. Fish and Wildlife Service
Fairbanks, AK**

American Peregrine Falcons Along the Upper Yukon River, Alaska, 1996

In the early 1990s, the U.S. Air Force proposed several changes in training activity in Alaska, and requested consultation with the Fish and Wildlife Service under Section 7 of the Endangered Species Act. The consultation process was completed on March 31, 1993. The Fish and Wildlife Service and the Air Force concluded that some incidental take of American peregrine falcons would likely result from low-level military aircraft. The Air Force established aircraft exclusion zones (2 miles horizontal distance or 2,000 feet above ground level) along the following river corridors where peregrine falcons nest at high density: upper Yukon River, Charley River, Kandik River, and Porcupine River.

The Fish and Wildlife Service and the Air Force have jointly monitored American peregrine falcons on the upper Yukon River since 1993. In 1996, 265 kilometers of the upper Yukon River were surveyed. Forty-five occupied nesting territories were located, and forty-one pairs, four single adult, and 66 young were observed. Twenty-six of 41 pairs (63%) were successful in raising young in 1996, and productivity was 1.61 young per total pair and 2.54 young per successful pair. Since 1991, productivity (young per total pair) has decreased throughout the study area, but the decrease has been greater in the lower part of the study area.

Military aircraft were observed nearly every day that researchers were in the field. Most aircraft were at very high altitude (over 10,000 feet AGL). All low-level (less than 5,000 feet AGL) military aircraft observed complied with recommended exclusion zones (2 miles horizontal distance/2,000 feet AGL). All low-level flights observed in or near the Yukon River study area were in the lower part of the study area in the YUKON 2 MGA.

Several factors have the potential to influence productivity of peregrine falcons, including weather, prey, habitat, contaminants, density of breeding pairs, and disturbance. In order to assess the impacts and relative importance of any of these factors on productivity of peregrine falcons, each of the factors need to be evaluated.

Prepared by:
Endangered Species
U.S. Fish and Wildlife Service
101 12th Avenue, Box 19
Fairbanks, AK 99701

Prepared for:
354th Fighter Wing
Eleventh Air Force
U.S. Air Force
Eielson Air Force Base, AK 99702

Introduction

American peregrine falcons (*Falco peregrinus anatum*) are medium-sized raptors that prey almost entirely on birds. Their range extends from Mexico north to the tree-line in Canada and Alaska. In Alaska, they occur in the forested interior, nesting primarily along the major rivers. In the northern parts of its range, the American peregrine falcon is highly migratory, wintering as far south as Brazil and Argentina.

Beginning in the late 1940s, the use of persistent organochlorine pesticides greatly affected American peregrine falcons in North America. These pesticides affected mortality and behavior, and caused birds to lay thin-shelled eggs that often failed to hatch and consequently lowered reproduction. This species was classified as "endangered" in 1973 under the Endangered Species Act. In Alaska, local populations declined to approximately 20 percent of historical levels by the mid-1970s. In 1972, the United States restricted the use of persistent organochlorine pesticides, and local populations in Alaska began to increase in 1978 and have continued to do so.

The U.S. Air Force conducts flight training activities to assist in meeting its primary mission of ensuring national security through well-trained, combat-ready tactical forces. Military Operations Areas (MOAs) in Alaska are used to conduct realistic air-to-air and air-to-ground training that includes air combat training, low-altitude training, and intercept training. Military aircraft training activity during the 1980s in the YUKON 1 and 2 MOAs (Figure 1) consisted primarily of A-10 aircraft from Eielson Air Force Base. In 1986, the Air Force proposed to change some flight rules in the MOAs in Alaska and requested consultation under Section 7 of the Endangered Species Act. The Fish and Wildlife Service prepared a Biological Opinion on April 15, 1987, to address those changes. In that Biological Opinion, the Service recommended flight restrictions around selected high-density peregrine falcon nesting areas, primarily along the Yukon and Charley rivers, and the Air Force concurred with the proposed recommendations. In the early 1990s, the Air Force proposed several additional changes to training activity in Alaska. The changes included adding an F-16 squadron, increasing the number of aircraft stationed in Alaska, increasing the size of Military Training Routes and Military Operations Areas, and initiating major flying exercises (Cope Thunder) in Alaska.

In March 1993, the Service and the Air Force concluded formal consultation regarding proposed changes in the Air Force's aircraft training operations in Alaska. In the March 31, 1993, Biological Opinion, the Service concluded that some incidental take of American peregrine falcons would likely result from low-level training operations. The Air Force concurred with that opinion, and agreed to establish aircraft exclusion zones around the following river corridors where peregrine falcons nest at high density: upper

Yukon River (between Circle, Alaska and the Alaska-Yukon Territory border), Charley River, Kandik River, and Porcupine River. These exclusion zones require that the Air Force avoid these areas by flying at least 2 miles horizontal distance or at least 2,000 feet above ground level (AGL). One hundred and fourteen nest sites have been observed along these rivers. Seventy-nine American peregrine falcon nest sites have been observed in the YUKON 1-5 MOAs outside the protected river corridors, but exclusion zones do not apply to these nest sites. Establishment of aircraft exclusion zones along the river corridors provides protection for most of the known nest sites while also providing large areas for training without exclusion zones.

When the incidental take of a listed species is expected, the level of incidental take anticipated must be identified and monitored. If the anticipated level of incidental take is exceeded, consultation must be reinitiated. Following the March 31, 1993, Biological Opinion, the Air Force and the Service agreed to monitor incidental take of American peregrine falcons. This report summarizes monitoring activity along the upper Yukon River in 1996.

Objectives

The objectives of the 1996 monitoring program were to:

1. Monitor nesting territory occupancy, breeding success, and productivity of American peregrine falcons along the upper Yukon River; and
2. Monitor aircraft activity in the survey area and compliance with exclusion zones, and, if possible, determine reactions of peregrine falcons to aircraft.

Study Area

The study area is located on a section of the Yukon River between the Alaska-Yukon Territory border and Circle, Alaska, a distance of 265 km (Figure 1). The river elevation varies from 260 m (865 ft) above sea level at the border to 170 m (560 ft) at Circle. Cliffs, rock outcrops, and dirt banks are common along the river. The vegetation of the area is a mosaic of wet meadows and shrub thickets, primarily dominated by various *Salix* spp., black spruce and white spruce (*Picea mariana* and *P. glauca*) and aspen (*Populus tremuloides*) woodlands and forests. Along the Yukon River and major tributaries, cottonwood (*P. spp.*), balsam poplar (*P. Balsamifera*), and white spruce forests, medium and tall shrub thickets (primarily dominated by various *Salix* spp.), and sparsely vegetated gravel bars dominate.

The area surveyed was limited to about 0.5 km on either side of the river. The upper Yukon River in this area falls within portions of YUKON 2, 3, and 4 MOAs.

Methods

Three surveys were conducted in 1996: the first from May 27 through June 6 to locate occupied nesting territories, the second June 18 to June 20 to determine hatching dates, and the third from June 30 through July 11 to determine breeding success and productivity. Surveys were conducted using a 21-foot river boat launched from Circle, motoring up the river to the Alaska-Yukon Territory border, and returning to Circle. During the first survey, all potential nesting territories along the river were observed from shoreline or islands using binoculars and spotting scopes. Observations generally were conducted for a minimum of four hours. When possible, campsites were chosen for their proximity to potential nesting territories to extend survey periods. During this survey, ten eggs were collected for pesticide analysis from nest sites in the study area. During the second survey, eyries were entered using standard rock climbing techniques to count the number of young, band young, collect unhatched eggs, and to check prey remains. Young falcons were banded with Fish and Wildlife Service (metal numbered) and color (color-coded metal with numbers) bands. Recoveries of banded birds provide information on migration routes, wintering areas, and population dynamics. Whenever possible, investigators also identified color-marked adult peregrine falcons for dispersal, movement, and mortality studies.

Nesting territories were noted on U.S. Geological Survey topographic maps, and nest occupancy data and nest site characteristics were entered onto Alaska Raptor Observation Record Cards (Appendix A). Narrative descriptions of behavior, nest site locations, and other observations were kept in field notebooks. Terminology and definitions followed that described in the National Wildlife Federation's Raptor Management Techniques Manual (1986) (Appendices B and C).

The following information was collected:

1. The number of nesting territories occupied by a pair;
2. The number of nesting territories occupied by a single adult;
3. The number of pairs attempting to breed;
4. The number of pairs with nestlings; and
5. The number of nestlings reaching 2 to 4 weeks of age.

Results

Results - American Peregrine Falcon Surveys. Forty-five occupied nest territories (41 pairs and 4 lone adults) were located along the upper Yukon River in 1996. Twenty-six of 41 pairs (63%) were successful, and produced 66 nestlings (2 to 4 weeks old) in 1996. Productivity was 1.61 young per total pair and 2.54 young per successful pair (Table 1). Nesting density on the upper Yukon River averaged one pair per 6.2 km; the closest two occupied nest sites were 1.5 km apart. In the YUKON 1-5 MOAs, peregrine falcon nesting is most dense on the upper Yukon River; other nesting territories are scattered throughout the MOAs (Figure 1) (Ambrose et al. 1993; Ambrose 1994; 1995; Ritchie and Rose 1994; 1996).

Results - Contaminant Levels. Sixty-five eggs from American peregrine falcons in Alaska have been analyzed for environmental contaminants, two in the 1970s, 51 in the 1980s, and 12 in the early 1990s. DDE in these eggs has shown a declining trend, and egg shell thickness has been increasing during this same period. The mean (geometric) DDE level in eggs during the 1970s, 1980s and 1990s was 6.687, 8.224, and 4.073 parts per million (wet weight) respectively. Levels of DDD, DDT, dieldrin, and PCBs also declined during this period. The mean (geometric) egg shell thickness during these three periods was 0.302 mm, 0.309 mm, and 0.324 mm respectively. Although still present at detectable levels, contaminants in eggs of American peregrine falcons in Alaska did not appear to be influencing breeding success or productivity in the early 1990s. Analysis of eggs collected in 1995 has not been completed at this time, but it is expected that contaminant levels will still be below that which would negatively affect breeding success or productivity.

Results - Aircraft Activity. Military aircraft were frequently observed conducting routine training over or near the Yukon River. The types of aircraft observed included fighters (F-18, F-15, F-16, A-10, and Tornados) and tankers (KC-10 and KC-135). Most aircraft observed were at very high altitude (over 10,000 feet AGL). All low-level (less than 5,000 feet AGL) aircraft observed were in the lower part of the study area within the YUKON 2 MOA, and all complied with the recommended exclusion zones established in the March 31, 1993, Biological Opinion. No reactions of peregrine falcons to low-level aircraft were observed in 1996. However, only on a few occasions were nest sites being observed when military aircraft were flying in the immediate area of the nest site.

Discussion

Accurate survey data for American peregrine falcons in interior Alaska prior to the late 1960s are not available. Local populations in interior Alaska probably began to decline soon after the use of DDT became widespread in the 1950s. The upper Yukon River

population declined to a low of 11 pairs in 1973 (Ritchie 1976), began increasing in 1978, and has continued to increase in the 1980s and 1990s. Fifty-seven different nesting territories have been used between 1977 and 1996. The highest number occupied of nesting territories in any one year was 45 in 1995.

The upper Yukon River has been surveyed continuously since 1977. Since 1977, this local population has increased steadily from 12 to 43 pairs (Table 1). Annual breeding success (pairs having at least one young 14 days old or more) has averaged 73.8% (range 51.4-94.4; SD=10.7) between 1977-1996. The number of young per total pair averaged 1.86 (range 1.17-3.00; SD=0.41) and the number of young per successful pair averaged 2.50 (range 2.11-3.18; SD=0.23).

During the years 1977 to 1990, productivity (young per total pair) was higher in the lower part of the study area, kilometer 170 to 265, than in the upper part, kilometer 0 to 170 (Tables 2 and 3). During this period, productivity averaged 2.10 young per pair in the lower area and 1.83 young per pair in the upper area. During the years 1991-1996, productivity averaged 1.69 in the lower area and 1.55 in the upper area. Although productivity decreased in both the upper and lower area since 1990, the decrease has been greater in the lower area (upper: 1.83 to 1.55, $p = 0.06$; lower: 2.10 to 1.69, $p = 0.02$). A slight decrease in productivity (young per pair) might be expected as the population recovers and breeding density increases as is happening with this population, but the greater decrease observed in the lower part of the study area could be the result of other factors as well.

The lower part of the study area (kilometer 170-265) is within YUKON 2 MOA and all low-level training activity observed has been in this area. Low-level training is authorized in this MOA. The upper part of the study area (kilometer 0-170) is within the YUKON 3 and 4 TMOAs, and very high altitude training is authorized during Major Flying Exercises and has been observed. No low-level flights have been observed in this area. While disturbance from low-level training activity is a possible cause of the greater decrease in productivity in the lower part of the study area, several environmental factors have the potential to influence productivity. These include weather, prey availability, habitat, breeding density, environmental contaminants, and disturbance. Available information suggests that all of these factors except disturbance have remained constant in both areas. Even if low-level training activity has influenced productivity, the extent of this influence and the relative importance compared to other factors is unknown. In-depth assessment of factors influencing productivity of peregrine falcons is beyond the scope of this project.

Recommendations

Current exclusion zones (2 miles horizontal distance or 2,000 feet above ground level) were established based on the assumption that these measures would be adequate to minimize disturbance to nesting peregrine falcons. However, some aspect of low-level (less than 5,000 feet AGL) training activity may be influencing productivity. In the 1993 Biological Opinion, the Service's primary concern was "startle effect" caused by sonic booms or unexpected, very loud noises, such as a high-speed, low-level jet approaching a nesting territory from the back side of the cliff and thus startling an incubating or brooding adult falcon as the aircraft passed over the nest. Sonic booms caused by aircraft, even those flying over 5,000 feet AGL, can startle peregrine falcons (pers. observation.). This "startle effect" has the potential to negatively influence breeding success and productivity, but the extent of this influence is unknown and difficult to measure. All factors, including low-level training and supersonic flight, that have the potential to influence breeding success and productivity should be studied to determine the relative importance of each. Until such time, low-level training and supersonic flight should be limited in areas with a high density of nesting peregrine falcons.

Summary of recommendations:

1. Continue current exclusions zones of 2 miles horizontal distance or 2,000 feet AGL along the upper Yukon, Charley, Kandik, and Porcupine rivers;
2. Do not increase low-level training activity and supersonic flight in the vicinity of high-density nesting areas until the influence of such activity is assessed;
3. Continue to monitor occupancy, breeding success, and productivity of American peregrine falcons in selected on- and off-river areas;
4. Monitor noise levels at nest sites along the upper Yukon River, and compare noise levels with occupancy, breeding success and productivity; and
5. Evaluate all factors, including low-level aircraft and supersonic flight, that have the potential to influence nesting territory occupancy, breeding success, and productivity of American peregrine falcons.

Acknowledgments

The 354th Fighter Wing, U.S. Air Force, Eielson Air Force Base and the Division of Endangered Species, U.S. Fish and Wildlife Service provided funding for this monitoring program. Mr. Gerald Von Rueden, 354 CES/CEVN, assisted in financial support and study plan preparation. K. Ambrose, M. Ambrose, C. Donaldson, M. Donaldson, F. Mann, C. McIntyre, and E. Taylor assisted in field work, and C. Donaldson prepared figures used in the report.

Literature Cited

- Ambrose, R. E., R. J. Ritchie, C. M. White, P. F. Schempf, T. Swem, and R. Dittrick. 1988. Changes in the Status of peregrine falcon populations in Alaska. Pages 73-82 in *Peregrine Falcon Populations: Their Management and Recovery* (T. J. Cade, J. H. Enderson, C. G. Thelander and C. M. White, Eds.). The Peregrine Fund, Inc., Boise, ID. 949 pp.
- Ambrose, S., Fadely, J., and C. McIntyre. 1993. Peregrine falcon surveys in Military Operations Areas in east-central Alaska, 1993. Unpublished report to the 354th Fighter Wing, Eielson Air Force Base, Alaska. 20 pp.
- Ambrose, S. 1994. American peregrine falcons along the upper Yukon River, Alaska, 1994. Unpublished report to the 354th Fighter Wing, Eielson Air Force Base, AK. 11 pp.
- Ambrose, S. 1995. American peregrine falcons along the upper Yukon River, Alaska, 1995. Unpublished report to the 354th Fighter Wing, Eielson Air Force Base, AK. 10 pp.
- National Wildlife Federation. 1987. Raptor Management Techniques Manual (B.A. Giron Pendleton, B.A. Millsap, K.W. Cline, and D.M. Bird, Eds.). Natl. Wildl. Fed., Washington, D.C. 420 pp.
- Ritchie, R. J. 1976. A suggested management approach for the upper Yukon River, Alaska. M. S. thesis, Univ. of Alaska, Fairbanks, AK.
- Ritchie, R. J., and J. R. Rose. 1994. Peregrine falcon (*Falco peregrinus anatum*) and other raptor surveys in the YUKON MOAs 1-5, Alaska, 1994. Unpublished report to the U.S. Air Force, 611 ASG/LGV, Elmendorf A.F.B., Alaska. 22 pp.
- Ritchie, R. J., and J. R. Rose. 1996. Results of raptor surveys on the Tanana River and in YUKON MOAs 1-5, Alaska, 1996. Unpublished report to the U.S. Air Force, 611 ASG/LGV, Elmendorf A.F.B., Alaska. 24 pp.

Table 1. American Peregrine Falcons along the upper Yukon River, Alaska, 1977-1996.

Year	Pairs	Lone Adults	Pairs With Nestlings	Nestlings (10-30 d)	% Pairs Successful	Young/ Total Pr.	Young/ Succ. Pr.
1977	12	3	9	22	75.0	1.83	2.44
1978	16	3	12	28	75.0	1.75	2.33
1979	19	0	15	39	78.9	2.05	2.60
1980	17	3	16	44	94.1	2.59	2.75
1981	18	2	17	54	94.4	3.00	3.18
1982	23	2	16	40	69.6	1.74	2.50
1983	27	2	21	56	77.8	2.07	2.67
1984	25	2	21	48	84.0	1.92	2.29
1985	25	2	16	40	64.0	1.60	2.50
1986	27	0	18	48	66.7	1.78	2.67
1987	31	2	25	61	80.6	1.97	2.44
1988	33	1	24	57	72.7	1.73	2.38
1989	33	2	23	54	69.7	1.64	2.35
1990	35	1	28	76	80.0	2.17	2.71
1991	34	1	26	55	76.5	1.62	2.12
1992	35	5	18	41	51.4	1.17	2.28
1993	40	1	30	80	75.0	2.00	2.67
1994	42	1	24	55	57.1	1.31	2.29
1995	43	3	30	71	69.8	1.65	2.37
1996	41	4	26	66	63.4	1.61	2.54
MEAN					73.8	1.86	2.50
STANDARD DEV.					10.7	0.41	0.23

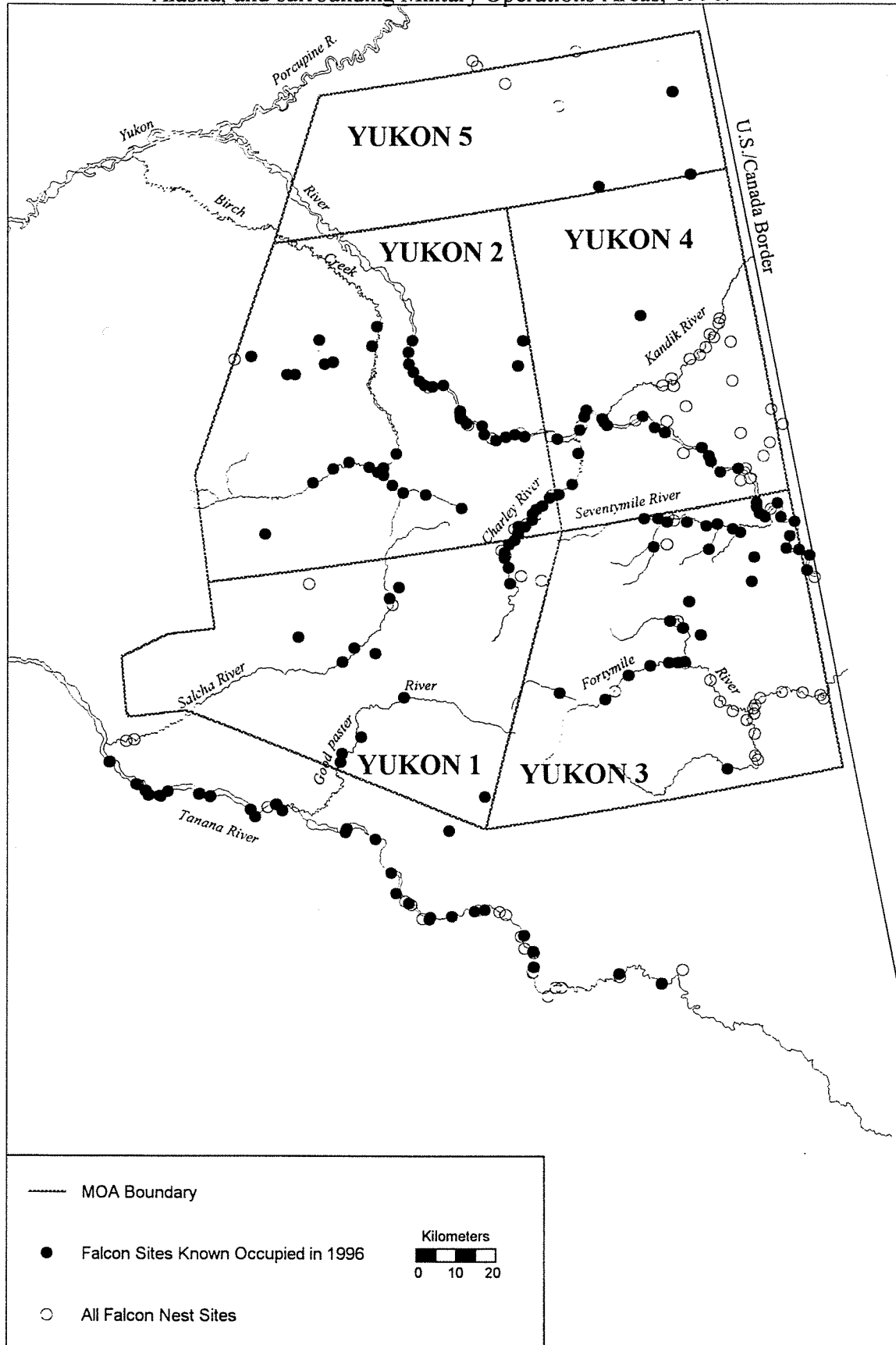
Table 2. Peregrine Falcons on the Upper Yukon River, 1977-1996, YUKON 3, 4 TMOA.

OTHERIDH:	YEAR AND ADULTS/YOUNG												1996							
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988		1989	1990	1991	1992	1993	1994	1995
YUK0001.0	0	0	0	0	1	0	2	2	0	0	0	0	0	0	0	0	0	2	0	0
YUK0003.5	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
YUK0009.5	0	0	0	0	0	0	0	0	0	0	2	2	2	1	1	2	2	2	2	2
YUK0014.5	0	0	0	0	0	2	0	1	1	0	2	2	2	2	2	2	2	2	2	2
YUK0020.0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
YUK0025.0	0	0	0	0	0	1	0	0	0	0	0	2	2	0	2	2	2	2	2	2
YUK0032.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	2	2	2
YUK0038.0	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
YUK0044.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2
YUK0048.5	0	0	0	0	0	0	0	0	0	2	2	2	2	0	0	1	2	2	2	2
YUK0052.0	0	0	0	0	0	0	2	2	2	0	0	2	2	2	2	2	2	2	2	2
YUK0054.0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	2	2	2	2	2
YUK0056.0	0	0	0	0	0	0	0	2	2	0	0	2	2	2	2	2	2	2	2	2
YUK0057.5	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	2	2	2	2	2
YUK0068.5	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
YUK0073.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
YUK0076.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
YUK0083.0	1	0	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
YUK0088.0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	2	2	2	2	2
YUK0090.5	2	4	2	2	2	2	2	2	2	2	0	0	0	2	2	2	2	2	2	2
YUK0095.0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
YUK0112.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
YUK0117.0	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
YUK0124.0	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
YUK0126.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
YUK0138.0	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
YUK0140.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
YUK0141.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
YUK0148.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
YUK0149.5	0	2	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2
YUK0154.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
YUK0155.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
YUK0166.0	0	0	0	0	0	0	0	2	2	2	0	0	0	0	2	2	2	2	2	2
YUK0167.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
YUK0168.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PAIRS	6	8	10	9	8	11	14	13	14	15	19	19	19	18	20	19	21	25	26	24
SINGLE ADULTS	2	2	0	2	3	1	0	1	0	0	0	0	0	2	1	3	0	0	1	1
PAIRS WITH YOUNG	5	6	8	7	7	9	13	11	9	8	15	13	9	13	18	14	9	18	15	18
PERCENT PAIRS SUCC.	83	75	80	78	88	69	93	85	64	53	79	68	72	90	74	43	72	58	75	70
YOUNG	10	15	20	16	24	20	33	24	22	22	33	27	31	42	42	31	19	45	34	40
YOUNG/TOTAL PAIR	1.67	1.88	2.00	1.78	3.00	1.54	2.36	1.95	1.57	1.47	1.74	1.42	1.72	2.10	1.63	0.90	1.80	1.31	1.67	1.96
YOUNG/SUCC. PAIR	2.00	2.50	2.50	2.29	3.43	2.22	2.54	2.18	2.44	2.75	2.20	2.08	2.38	2.33	2.21	2.11	2.50	2.27	2.22	2.81

Table 3. Peregrine Falcons on the Upper Yukon River, 1977-1996, YUKON 2 MOA.

OCCURRENCE:	YEAR AND ADULTS/YOUNG												1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
YUKO180.0	0	21	24	24	23	23	22	23	22	22	23	23	23	10	22	23	20	20	20	23	20											
YUKO181.0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
YUKO183.0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	23	22	20	0	23	20											
YUKO187.0	21	20	20	21	22	20	20	22	20	21	20	20	20	21	23	22	23	23	22	23	21											
YUKO191.5	0	0	0	0	22	22	24	20	23	23	22	23	22	22	22	21	21	23	20	0	23											
YUKO193.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0											
YUKO196.0	0	0	0	0	0	0	0	0	0	0	0	24	20	23	22	23	10	22	22	22	22											
YUKO199.0	24	21	23	24	24	20	22	23	20	22	22	20	22	22	23	22	10	23	22	23	23											
YUKO205.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0											
YUKO205.5	24	10	22	23	23	23	22	23	22	20	23	22	20	22	22	24	10	24	23	20	20											
YUKO208.5	21	0	20	21	0	0	22	22	20	21	23	22	23	22	24	10	24	23	20	23	20											
YUKO216.5	0	23	22	0	0	0	20	0	0	24	21	0	24	20	0	20	23	21	23	20	20											
YUKO211.5	0	0	0	21	22	20	0	0	20	0	0	23	0	0	0	23	10	0	22	20	23											
YUKO224.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	20											
YUKO229.0	22	21	23	24	24	24	24	22	20	20	23	24	22	22	23	20	22	22	22	22	20											
YUKO231.0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	20	0											
YUKO233.0	0	0	0	0	0	0	0	0	0	20	10	0	0	20	20	21	0	22	20	22	21											
YUKO235.0	0	23	23	24	24	20	23	22	23	20	23	23	22	22	23	21	20	24	23	22	22											
YUKO239.5	0	0	0	0	0	10	20	23	0	0	23	23	22	24	23	20	20	22	20	21												
YUKO243.5	0	24	23	24	23	22	23	22	22	24	24	23	20	24	23	23	22	23	24	22												
YUKO249.0	0	0	0	0	0	22	20	20	23	23	20	23	20	24	21	20	24	23	20	23												
YUKO254.0	0	20	20	23	24	24	24	22	24	22	24	23	23	23	23	20	20	24	20	20	20											
PAIRS	6	8	10	10	10	11	13	12	12	13	13	15	15	15	15	14	15	16	19	18												
SINGLE ADULTS	0	1	0	0	0	1	0	0	0	0	1	0	1	0	1	2	1	0	0	0												
PAIRS WITH YOUNG	5	6	7	10	10	7	9	10	7	9	11	12	10	13	12	9	12	11	13	10												
PERCENT PAIRS SUCC.	83	75	70	100	100	64	69	83	58	69	85	80	67	87	80	64	80	69	68	56												
YOUNG	12	13	20	29	31	20	26	24	19	22	31	34	22	40	25	22	36	25	35	21												
YOUNG/TOTAL PAIR	2.00	1.63	2.00	2.90	3.10	1.82	2.00	2.00	1.58	1.69	2.38	2.27	1.47	2.67	1.67	1.57	2.40	1.56	1.84	1.17												
YOUNG/SUCC. PAIR	2.40	2.17	2.66	2.90	3.10	2.86	2.89	2.40	2.71	2.44	2.82	2.83	2.20	3.08	2.08	2.44	3.00	2.27	2.69	2.10												

Figure 1. Locations of American peregrine falcon nest sites along the upper Yukon River, Alaska, and surrounding Military Operations Areas, 1996.



Appendix A. Raptor Observation Record Card (Feb. 1989).

RAPTOR OBSERVATION RECORD CARD (FEB 1989)									
OBSERVER NAME AND ADDRESS:					MAP NAME:				
SPECIFIC AREA (DESCRIBE):					OTHER NO. (e.g. Agency No.):				
					UTM-N or LATITUDE:				
SPECIES (COM NAME OR AOU ABBREV.):					UTM-E or LONGITUDE:				
DATE	TIME	SUR MET	NO. ADS	NO. SUB	NO. EGGS	NO. NEST	AGE NEST	NO. FLO	ACTIVITIES
SEASON SUMMARY		TOTAL:							
SURVEY METHOD:		ACTIVITY / BEHAVIOR (May Be More Than One)							
1. FOOT		1. PERCHED							
2. VEHICLE		2. FLYING							
3. BOAT		3. HUNTING/FORAGING							
4. PLANE		4. FEEDING ADULT							
5. HELICOPTER		5. TERR. DEFENSE							
6. INCIDENTAL OBS.		6. VOCALIZING							
		7. BODY CARE							
		8. COURTSHIP							
		9. NEST BUILDING							
		10. INCUBATING							
		11. BROODING							
		12. FEEDING YOUNG							
		13. COPULATING							
		14. OTHER:							
OFFICIAL NEST STATUS				NOTES, MAP, OR PHOTO ATTACHED? 1. YES 2. NO					
REMARKS (Mouth In Adult Par. Prey In Nest/Eyrie, Etc.):									

Front

RAPTOR NEST/EYRIE RECORD CARD (FEB 1989)			
TREE NEST-SPECIES:			
1. LIVE TREE	4. ARTIFICIAL		
2. SNAG	5. CAVITY IN TREE		
3. NEST BOX/PLATFORM	6. OTHER		
TREE HEIGHT (M):	E A		
TREE DIAMETER (CM):	E A		
HEIGHT OF NEST IN TREE (M):	E A		
DOMINANT HABITAT TYPES (up to three within 5 km of nest)			
1. CLIFF			
2. UNVEGETATED GROUND			
3. WET MEADOW			
4. DWARF SHRUB MEADOW (under dominated by grasses or sedges)			
5. GRASS MEADOW			
6. DWARF SHRUB MAT (dwarf shrubs <0.4 M high)			
7. LOW SHRUB THICKET (shrubs 0.5 - 1.1 M high)			
8. MED. SHRUB THICKET (shrubs 1.2 - 2.4 M high)			
9. TALL SHRUB THICKET (shrubs 2.5 - 5.0 M high)			
10. DECIDUOUS FOREST			
11. CONIFEROUS FOREST			
12. MIXED DECIDUOUS-CONIFER FOREST			
13. SCATTERED WOODLAND AND DWARF FOREST			
14. ARTIFICIAL HABITAT			
15. OTHER			
16. MARINE (dist. km)			
17. RIPARIAN (dist. km)			
18. LACUSTRINE/LAKE (dist. km)			
19. RIVER / STREAM (dist. km)			
20. OTHER PERENNIAL WATER (dist. km)			
FOR CLIFF NESTS - ABOVE CLIFF:			
(Orbital types) BELOW CLIFF:			
CIRCLE ANY THAT APPLY:			
1. PHOTO OF CLIFF TAKEN			
2. PHOTO OF EYRIE TAKEN			
3. EYRIE DESCRIP. ATTACHED			
4. PREY REMAINS COLL.			
5. EGG(S) COLLECTED			
6. EGG SHELLS COLLECTED			
7. WHITEWASH AT EYRIE			
8. OTHER WHITEWASH ON CLIFF			
9. OVERHANG AT EYRIE			
10. AFTERNOON SHADING:			
a. YES b. NO c. UNKNOWN			
GROUND NEST - SITUATION:			
1. LEDGE ON CLIFF			
2. STICKNEST ON CLIFF			
3. CAVITY (POTHOLE) ON CLIFF			
4. OPEN HILLSIDE			
5. LEVEL GROUND			
6. OTHER			
CLIFF ROCK TYPE: 1. SED 2. IGN 3. MET			
SPEC. FORMATION:			
CLIFF HEIGHT (M):			
CLIFF LENGTH (KM):			
HEIGHT OF NEST ON CLIFF (M):			
ELEVATION OF NEST ABOVE SEA LEVEL (FT):			
ASPECT OF SLOPE:			
ASPECT OF NEST:			
NEST CONDITION: 1. GOOD 2. POOR 3. REMNANT ONLY			
NEST ACCESSIBILITY (to ground predators):			
1. EASY 2. MOD. DIFFICULT 3. VERY DIFFICULT			
DISTANCE TO HUMAN ACTIVITY (KM):			
HUMAN ACTIVITY VISIBLE FROM NEST?			
1. YES 2. NO			
TYPE(S) OF HUMAN ACTIVITY:			
1. TRAIL 7. CONSTRUCTION			
2. ROAD 8. RESEARCH			
3. BOATING 9. MINING			
4. AIRCRAFT 10. OIL / GAS			
5. BUILDING(S) 11. LOGGING			
6. AGRICULTURE 12. OTHER:			
BANDING AND BAND RECOVERY INFORMATION			
AGE	SEX	AVISE NO. - COLOR / LEG	BAND CODE - COLOR / LEG

Back

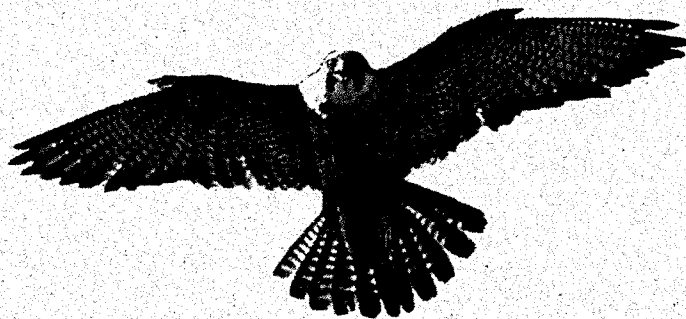
Appendix B. Definition of terms.

<u>Alternate Nest:</u>	An unoccupied nest site within the nesting territory of one pair of birds.
<u>Breeding Territory:</u>	The area within which courtship, copulation, nesting and food seeking usually occur.
<u>Eyrie:</u>	The actual ledge on a cliff containing eggs or young used by a pair of raptors during current nesting season.
<u>Fledged Young:</u>	Young that have flown for the first time. For survey purposes, young that have reached 80% or more of their respective fledging age are considered fledged young.
<u>Nest Site:</u>	The actual site of the nest or ledge. More than one nest site may be present within the territory of a pair of birds but used in different years.
<u>Nest Territory:</u>	An area that contains, or historically contained, one or more nests (or scrapes) within the breeding territory of a pair of mated birds, and where no more than one pair has ever bred in any year.
<u>Nestling:</u>	Young of the year between hatching and 80% of fledging age.
<u>Occupied Nest Terr.:</u>	A nesting territory where one or two birds showing an affinity for the nesting territory during the breeding season were observed.
<u>Productivity:</u>	The number of nestlings raised to banding age, expressed both as number per total pair and number per successful pair.
<u>Successful Breeding:</u>	Raising at least one nestling to banding age or older.
<u>Unoccupied Nest Terr.:</u>	A nesting territory where no bird showing an affinity for the territory during the breeding season was observed (investigators must spend a minimum of 4 hours at the territory during the incubation period to make this determination).

Appendix C. Breeding Status Terminology.

1. Unoccupied:
A nesting territory where no bird showing an affinity for the territory during the breeding season was observed (investigators must spend a minimum of 4 hours at the territory during the incubation period to make this determination).
2. Occupancy Unknown:
A nesting territory where no bird showing an affinity for the territory during the breeding season was observed but investigators spent less than 4 hours at the territory during the incubation period.
3. Occupied--Non-breeding:
A nesting territory where one or two birds showing an affinity for the nesting territory during the breeding season were observed but no eggs were laid (note: this category requires confirmation that no eggs were laid, therefore only those nests that were frequently observed can be assigned to this category).
4. Occupied--Breeding:
An occupied nesting territory where eggs were laid (evidence includes young in nest, eggs or eggshells, or adults seen incubating) but where final breeding success was not determined.
5. Occupied--Unsuccessful Breeding:
An occupied nesting territory where breeding was attempted but where no young reached 80% of its fledging age (for example, eggs destroyed or otherwise lost, eggs failed to hatch, or young hatched but died prior to fledging).
6. Occupied--Successful Breeding:
An occupied nesting territory where one or more young reached 80% of its fledging age.
7. Occupied--Breeding Status Unknown:
An occupied nesting territory where breeding or non-breeding could not be determined.
8. Occupied--Breeding Status Unknown, No Young Fledged:
An occupied nesting territory where breeding or non-breeding could not be determined but it was certain that no young fledged.

American Peregrine Falcons Along the Upper Yukon River, Alaska, 1995



**354th Fighter Wing
Eleventh Air Force
U.S. Air Force
Eielson Air Force Base, Alaska**



**Endangered Species
Northern Alaska Ecological Services
U.S. Fish and Wildlife Service
Fairbanks, Alaska**

American Peregrine Falcons Along the Upper Yukon River, Alaska, 1995

Military Operations Areas (MOAs) in Alaska are used to conduct realistic air-to-air and air-to-ground training that includes air combat training, low-altitude training, and intercept training. In the early 1990s, the Air Force proposed several changes in training activity in Alaska, and requested consultation with the Fish and Wildlife Service under Section 7 of the Endangered Species Act. The consultation process was completed on March 31, 1993, and the Fish and Wildlife Service and the Air Force concluded that some incidental take of American peregrine falcons would likely result from low-level training operations. The Air Force established aircraft exclusion zones (2 miles horizontal distance or 2,000 feet above ground level) along the following river corridors where peregrine falcons nest at high density: upper Yukon River, Charley River, Kandik River, and Porcupine River.

The Fish and Wildlife Service and the Air Force have jointly monitored American peregrine falcons on the upper Yukon River since 1993. In 1995, 266 kilometers of the upper Yukon River were surveyed. Forty-six occupied nesting territories were located (the highest ever), and forty-three pairs, three single adult, and 71 young were observed. Thirty of 43 pairs (70%) were successful in raising young in 1995, and productivity was 1.65 young per total pair and 2.37 young per successful pair. Contaminants in American peregrine falcons do not appear to be influencing breeding success or productivity.

Most military aircraft observed were at very high altitude (over 10,000 feet AGL). All low-level military aircraft observed complied with recommended exclusion zones (2 miles/2,000 feet AGL). No reactions of American peregrine falcons to aircraft were observed.

Compliance with current exclusion zones has been effective in minimizing disturbance to nesting American peregrine falcons, and American peregrine falcons continue to recover in interior Alaska.

Prepared by: Skip Ambrose
U.S. Fish and Wildlife Service
1412 Airport Way
Fairbanks, Alaska

Prepared for: 354th Fighter Wing
Eleventh Air Force
U.S. Air Force
Eielson Air Force Base, Alaska

Introduction

American peregrine falcons (*Falco peregrinus anatum*) are medium-sized raptors that prey almost entirely on birds. Their range extends from Mexico north to the tree-line in Canada and Alaska. In Alaska, they occur in the forested interior, nesting primarily along the major rivers. In the northern parts of its range, the American peregrine falcon is highly migratory, wintering as far south as Brazil and Argentina.

Beginning in the late 1940s, the use of persistent organochlorine pesticides greatly affected American peregrine falcons in North America. These pesticides affected mortality and behavior, and caused birds to lay thinned-shelled eggs that often failed to hatch and consequently lowered reproduction. This species was classified as "endangered" in 1973 under the Endangered Species Act. In Alaska, local populations declined to approximately 20 percent of historical levels by the mid-1970s. In 1972, the United States restricted the use of persistent organochlorine pesticides, and local populations in Alaska began to increase in 1978 and have continued to do so.

The U.S. Air Force conducts flight training activities to assist in meeting its primary mission of ensuring national security through well-trained, combat-ready tactical forces. Military Operations Areas (MOAs) in Alaska are used to conduct realistic air-to-air and air-to-ground training that includes air combat training, low-altitude training, and intercept training. Military aircraft training activity during the 1980s in the YUKON 1 and 2 MOAs (Figure 1) consisted primarily of A-10 aircraft from Eielson Air Force Base. In 1986, the Air Force proposed to change some flight rules in the MOAs in Alaska and requested consultation under Section 7 of the Endangered Species Act. The Fish and Wildlife Service prepared a Biological Opinion on April 15, 1987, to address those changes. In that Biological Opinion, the Service recommended flight restrictions around selected high-density peregrine falcon nesting areas, primarily along the Yukon and Charley rivers, and the Air Force concurred with the proposed recommendations. In the early 1990s, the Air Force proposed several additional changes to training activity in Alaska. The changes included conversion from A-10 to F-16 aircraft, an increase in the number of aircraft, an increase in the size of Military Training Routes and Military Operations Areas, and the initiation of major flying exercises (Cope Thunder) in Alaska.

In March 1993, the Service and the Air Force concluded formal consultation regarding proposed changes in the Air Force's aircraft training operations in Alaska. In the March 31, 1993, Biological Opinion, the Service concluded that some incidental take of American peregrine falcons would likely result from low-level training operations. The Air Force concurred with that opinion, and agreed to establish aircraft exclusion zones around the following river corridors where peregrine falcons nest at high density: upper Yukon River (between Circle, Alaska and the Alaska-Yukon Territory border), Charley River, Kandik River, and Porcupine River. These exclusion zones consist of avoiding these areas by at least 2 miles horizontal distance or at least 2,000 feet above ground

level (AGL). Thirty-four American peregrine falcon nest sites have been observed in the YUKON 1, 2, 3, and 4 MOAs outside the protected river corridors, but exclusion zones do not apply to these nest sites (some additional nest sites almost certainly occur outside the river corridors). Establishment of aircraft exclusion zones along the river corridors provides protection for most of the known nest sites while also providing large areas for training without exclusion zones.

When the incidental take of a listed species is expected, the level of incidental take anticipated must be identified and monitored. If the anticipated level of incidental take is exceeded, consultation must be reinitiated. Following the March 31, 1993, Biological Opinion, the Air Force and the Service agreed to jointly monitor incidental take of American peregrine falcons. This report summarizes monitoring activity along the upper Yukon River in 1995.

Objectives

The objectives of the 1995 monitoring program were to:

1. Monitor nesting territory occupancy, breeding success, and productivity of American peregrine falcons along the upper Yukon River;
2. Monitor aircraft activity in the survey area and compliance with exclusion zones, and, if possible, determine reactions of peregrine falcons to aircraft; and
3. Collect a sample of American peregrine eggs for pesticide analysis to determine current impacts of pesticides on breeding success and productivity.

Study Area

The study area was the Yukon River between the Alaska-Yukon Territory border and Circle, Alaska, a distance of 266 km (Figure 1). The area surveyed was limited to about 0.5 km on either side of river. The upper Yukon River in this area falls within portions of YUKON 1, 3, and 4 MOAs.

Methods

Three surveys were conducted in 1995: the first from May 25 through June 10 to locate occupied nesting territories, and the second and third from July 1 through July 18 and July 26 through July 29, respectively, to determine breeding success and productivity. Surveys were conducted using a 21-foot river boat launched from Circle and motoring up the river to the Alaska-Yukon Territory border and returning to Circle. During the first

survey, all potential nesting territories along the river were observed from shoreline or islands using binoculars and spotting scopes. Observations generally were conducted for a minimum of 4 hours. When possible, campsites were chosen for their proximity to likely bluffs to extend survey periods. During this survey, ten eggs were collected for pesticide analysis from nest sites in the study area. During the second survey, eyries were entered using standard rock climbing techniques to count the number of young, band young, collect unhatched eggs, and to check prey remains. Young falcons were banded with Fish and Wildlife Service (metal numbered) and color (color-coded metal with numbers) bands. Recoveries of banded birds provide information on migration routes, wintering areas, and population dynamics. Whenever possible, investigators also identified color-marked adult peregrine falcons for dispersal, movement, and mortality studies.

Nesting territories were noted on U.S. Geological Survey topographic maps, and nest occupancy data and nest site characteristics were entered onto Alaska Raptor Observation Record Cards (Appendix A). Narrative descriptions of behavior, nest site locations, and other observations were kept in field notebooks. Terminology and definitions followed that described in the National Wildlife Federation's Raptor Management Techniques Manual (1986) (Appendixes B and C).

The following information was collected:

1. The number of nesting territories occupied by a pair;
2. The number of nesting territories occupied by a single adult;
3. The number of pairs attempting to breed;
4. The number of pairs with young; and
5. The number of young reaching 3 to 4 weeks of age.

Results - Peregrine Falcon Surveys

Forty-six occupied nest territories were located along the upper Yukon River in 1995; 43 pairs, 3 single adult, and 71 young were observed (Table 1). Thirty of 43 pairs (70%) were successful in raising young in 1995, and productivity was 1.65 young per total pair and 2.37 young per successful pair. Nesting density on the upper Yukon River averaged one pair per 6.2 km; the closest two nest sites were 1.0 km apart. In the YUKON 1-4 MOAs, peregrine falcon nesting is most dense on the upper Yukon and Charley rivers; other nesting territories are scattered throughout the MOAs (Figure 1) (Ambrose et al. 1993; Ambrose 1994; Ritchie and Rose 1994).

Results - Contaminant Levels

Analysis of eggs collected in 1995 has not been completed at this time (complete analysis normally takes six to eight months). However, DDE in eggs from American peregrine falcons in Alaska collected and analyzed in the 1970s, 1980s, and 1990s has shown a declining trend. Egg shell thickness has been increasing during this same period. The mean (geometric) DDE level in eggs during the 1970s, 1980s and 1990s was 6.687, 8.224, and 4.073 parts per million (wet weight) respectively. Levels of DDD, DDT, dieldrin, and PCBs also declined during this period. The mean (geometric) egg shell thickness during these three periods was 0.302 mm, 0.309 mm, and 0.324 mm respectively. A total of 65 eggs from American peregrine falcons in Alaska have been analyzed, two in the 1970s, 51 in the 1980s, and 12 in the 1990s. Although still present in measurable amounts, contaminants in eggs of American peregrine falcons in Alaska do not currently appear to be influencing breeding success or productivity.

Results - Aircraft Activity

The two survey periods in 1995 (May 25 to June 10 and July 1 to July 29) overlapped with one Cope Thunder flying exercise during which several aircraft were observed. Additionally, military aircraft were frequently observed conducting routine training over or near the Yukon River. The types of aircraft observed included fighters (F-15, F-16, A-10, and Tornados) and tankers (KC-10 and KC-135). Most aircraft observed were at very high altitude (over 10,000 feet AGL); all low-level aircraft observed complied with the recommended exclusion zones established in the March 31, 1993, Biological Opinion. No reactions by American peregrine falcons to aircraft or sonic booms were observed in 1995. Reactions by American peregrine falcons to sonic booms were observed in 1993 (Ambrose et al. 1993), but none were observed in 1994 (Ambrose 1994).

Discussion

Accurate survey data for American peregrine falcons in interior Alaska prior to the late 1960s are not available. Local populations in interior Alaska probably began to decline soon after the use of DDT became widespread in the 1950s. The upper Yukon River population declined to a low of 11 pairs in 1973 (Ritchie 1976), began increasing in 1978 (restrictions were placed on the use of organochlorine pesticides in 1972), and has continued to increase to 43 pairs in 1995, the highest number ever recorded (Ambrose et al. 1988) (Table 1).

The Service, in cooperation with other federal and state agencies, has surveyed the upper Yukon River almost continuously since 1977. During this period, the population has increased steadily from 12 to 43 pairs (Table 1). Annual breeding success (pairs having at least one young reach 3 weeks or more of age) has averaged 74.3% (range 51.4-94.4; SD=10.7). The number of young per total pair averaged 1.87 (range 1.17-3.00; SD=0.41)

and the number of young per successful pair averaged 2.50 (range 2.11-3.18; SD=0.24). These values demonstrate the natural variability in breeding success and productivity in a healthy population. Factors that may influence these statistics include weather, age of the breeding adults, habitat types around the nest site, nest site characteristics (e.g., cliff height, accessibility, exposure), and environmental contaminants. Assessing the effects of low-level military aircraft is difficult given this normal variation, and will require several years of observations at several different nest sites.

Recommendations

Current exclusion zones (2 miles horizontal distance or 2,000 feet above ground level) have been effective in minimizing disturbance to American peregrine falcons nesting along the upper Yukon, Charley, Kandik, and Porcupine rivers. These exclusion zones have helped insure the continued recovery of American peregrine falcons in Alaska, and should continue in areas where American peregrine falcons nest at relatively high density.

The Air Force is required to monitor the incidental take of American peregrine falcons as specified in the March 31, 1993, Biological Opinion. The Service will continue to work with the Air Force to accomplish this monitoring requirement.

Factors other than low-level aircraft (e.g., weather, habitat around nest sites, prey availability, age of breeding adults, nest site characteristics, and environmental contaminants) can affect breeding success and productivity of American peregrine falcons. These factors should be monitored in conjunction with occupancy and reproductive rates to determine if differences in the control and disturbed areas are attributable to low-level aircraft or to other factors. Additional research will be necessary to determine if supersonic flight down to 5,000 feet AGL has any long-term detrimental effects on nesting peregrine falcons.

Summary of recommendations:

1. Continue current exclusions zones of 2 miles horizontal distance or 2,000 feet AGL along the upper Yukon, Charley, Kandik, and Porcupine rivers;
2. Continue monitoring population levels, breeding success, productivity, and incidental take of American peregrine falcons in selected on- and off-river areas;
3. Assess long-term effects of sonic booms on nesting peregrine falcons; and
4. Evaluate factors other than low-level aircraft that have the potential to influence nesting territory occupancy, breeding success, and productivity of American peregrine falcons.

Acknowledgments

The 354th Fighter Wing, U.S. Air Force, Eielson Air Force Base and the Division of Endangered Species, U.S. Fish and Wildlife Service provided funding for this monitoring program. Mr. Gerald Von Rueden, 354 CES/CEVN, assisted in financial support and study plan preparation. M. Britten, C. Connella, T. Johnson, C. McIntyre, and T. Woods assisted in field work, and C. Donaldson prepared figures used in the report.

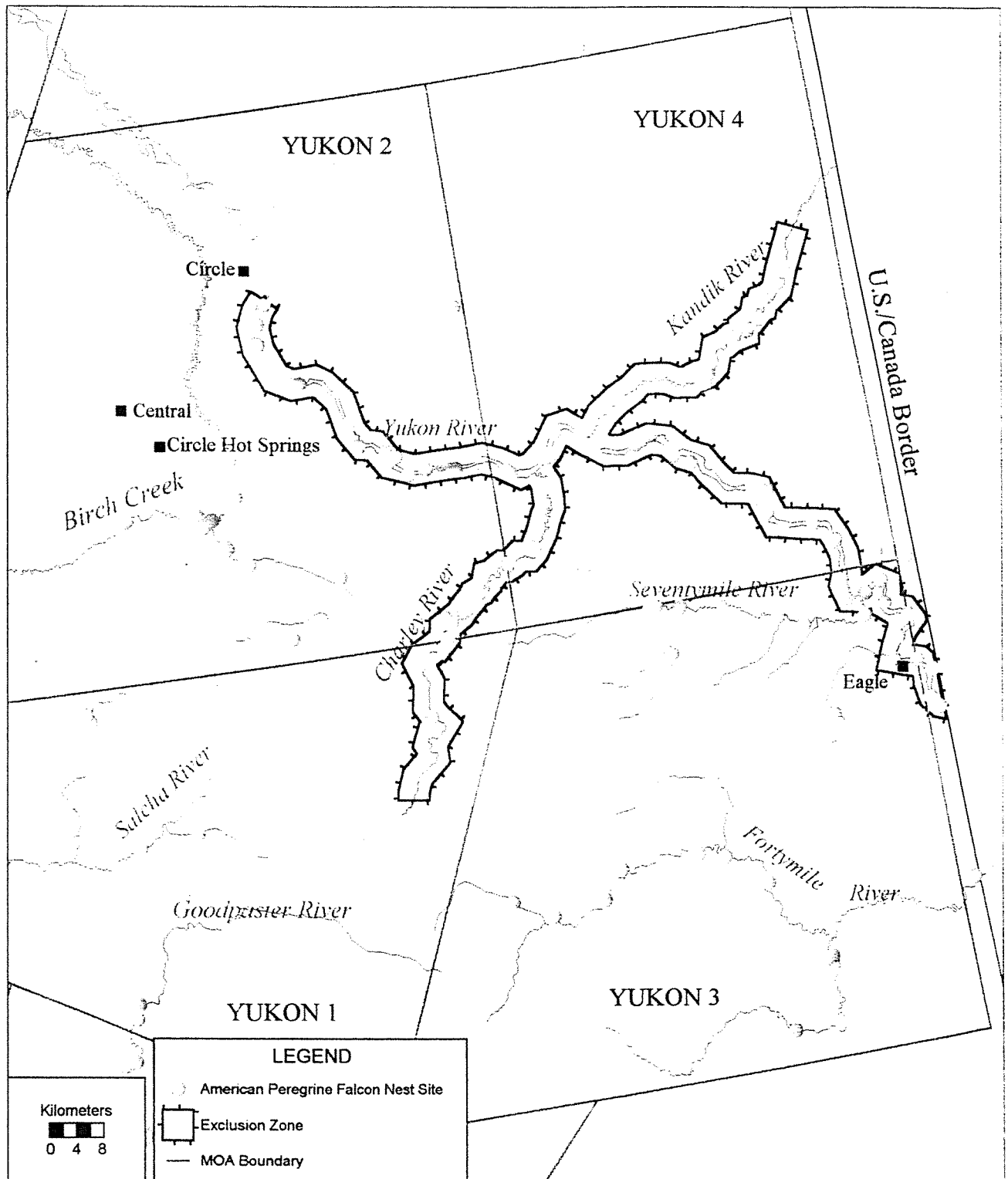
Literature Cited

- Ambrose, R. E., R. J. Ritchie, C. M. White, P. F. Schempf, T. Swem, and R. Ditttrick. 1988. Changes in the Status of peregrine falcon populations in Alaska. Pages 73-82 in *Peregrine Falcon Populations: Their Management and Recovery* (T. J. Cade, J. H. Enderson, C. G. Thelander and C. M. White, Eds.). The Peregrine Fund, Inc., Boise, ID. 949 pp.
- Ambrose, S., Fadely, J., and C. McIntyre. 1993. Peregrine falcon surveys in Military Operations Areas in east-central Alaska, 1993. Unpublished report to the 354th Fighter Wing, Eielson Air Force Base, Alaska. 20 pp.
- Ambrose, S. 1994. American peregrine falcons along the upper Yukon River, Alaska, 1994. Unpublished report to the 354th Fighter Wing, Eielson Air Force Base, AK. 11 pp.
- National Wildlife Federation. 1987. Raptor Management Techniques Manual (B.A. Giron Pendleton, B.A. Millsap, K.W. Cline, and D.M. Bird, Eds.). Natl. Wildl. Fed., Washington, D.C. 420 pp.
- Ritchie, R. J. 1976. A suggested management approach for the upper Yukon River, Alaska. M. S. thesis, Univ. of Alaska, Fairbanks, AK.
- Ritchie, R. J., and J. R. Rose. 1994. Peregrine falcon (*Falco peregrinus anatum*) and other raptor surveys in the YUKON MOAs 1-5, Alaska, 1994. Unpublished report to the U.S. Air Force, 611 ASG/LGV, Elmendorf A.F.B., Alaska. 22 pp.

Table 1. American Peregrine Falcons along the upper Yukon River, Alaska, 1977-1995.

Year	Pairs	Pairs With Young	Lone Adults	Young	Percent Pairs Success.	Young/ Total Pair	Young/ Success. Pair
1977	12	9	3	22	75.0	1.83	2.44
1978	16	12	3	28	75.0	1.75	2.33
1979	19	15	0	39	78.9	2.05	2.60
1980	17	16	3	44	94.1	2.59	2.75
1981	18	17	2	54	94.4	3.00	3.18
1982	23	16	2	40	69.6	1.74	2.50
1983	27	21	2	56	77.8	2.07	2.67
1984	25	21	2	48	84.0	1.92	2.29
1985	25	16	2	40	64.0	1.60	2.50
1986	27	18	0	48	66.7	1.78	2.67
1987	31	25	2	61	80.6	1.97	2.44
1988	33	24	1	57	72.7	1.73	2.38
1989	33	23	2	54	69.7	1.64	2.35
1990	35	28	1	76	80.0	2.17	2.71
1991	34	26	1	55	76.5	1.62	2.12
1992	35	18	5	41	51.4	1.17	2.28
1993	40	30	1	80	75.0	2.00	2.67
1994	42	24	1	55	57.1	1.31	2.29
1995	43	30	3	71	69.8	1.65	2.37
MEAN					74.3	1.87	2.50
STANDARD DEVIATION					10.7	0.41	0.24

Figure 1. Locations of American peregrine falcon nest sites along the upper Yukon River, Alaska, and surrounding Military Operations Areas, 1995.



Appendix A. Raptor Observation Record Card (Feb. 1989).

RAPTOR OBSERVATION RECORD CARD (FEB 1989)										
OBSERVER NAME AND ADDRESS:				MAP NAME:						
				STATE - MAP # - NEST TERR. # - SITE # - YEAR						
SPECIFIC AREA (DESCRIBE):				OTHER NO. (e.g. Agency No.):						
				UTM-N or LATITUDE:						
				UTM-E or LONGITUDE:						
SPECIES (COM NAME OR AOU ABBREV.):										
DATE	TIME	SUR MET	NO. ADS	NO. SUB	NO. EGGS	NO. NEST	AGE NEST	NO. FLG	ACTIVITIES	
						E	E	E		
						A	A	A		
						E	E	E		
						A	A	A		
						E	E	E		
						A	A	A		
SEASON SUMMARY		TOTAL:								
SURVEY METHOD:		ACTIVITY / BEHAVIOR (May Be More Than One)								
1. FOOT		1. PERCHED								
2. VEHICLE		2. FLYING								
3. BOAT		3. HUNTING/FORAGING								
4. PLANE		4. FEEDING ADULT								
5. HELICOPTER		5. TERR. DEFENSE								
6. INCIDENTAL OBS.		6. VOCALIZING								
		7. BODY CARE								
		8. COURTSHIP								
		9. NEST BUILDING								
		10. INCUBATING								
		11. BROODING								
		12. FEEDING YOUNG								
		13. COPULATING								
		14. OTHER:								
OFFICIAL NEST STATUS			NOTES, MAP, OR PHOTO ATTACHED? 1. YES 2. NO							
REMARKS (Mount in Adult Pair, Prey in Nest/Eyrie, Etc.):										

Front

RAPTOR NEST/EYRIE RECORD CARD (FEB 1989)			
TREE NEST-SPECIES:			
1. LIVE TREE	4. ARTIFICIAL		
2. SNAG	5. CAVITY IN TREE		
3. NEST BOX/PLATFORM	6. OTHER		
TREE HEIGHT (M):	E A		
TREE DIAMETER (CM):	E A		
HEIGHT OF NEST IN TREE (M):	E A		
DOMINANT HABITAT TYPES (up to three within .5 km of nest)			
1. CLIFF			
2. UNVEGETATED GROUND			
3. WET MEADOW			
4. DWARF SHRUB MEADOW (tundra dominated by grasses or sedges)			
5. GRASS MEADOW			
6. DWARF SHRUB MAT (dwarf shrubs <0.4 M high)			
7. LOW SHRUB THICKET (shrubs 0.5 - 1.1 M high)			
8. MED. SHRUB THICKET (shrubs 1.2 - 2.4 M high)			
9. TALL SHRUB THICKET (shrubs 2.5 - 5.0 M high)			
10. DECIDUOUS FOREST			
11. CONIFEROUS FOREST			
12. MIXED DECIDUOUS-CONIFER FOREST			
13. SCATTERED WOODLAND AND DWARF FOREST			
14. ARTIFICIAL HABITAT	15. OTHER		
16. MARINE (dist. km):	E A		
17. RIPARIAN (dist. km):	E A		
18. LACUSTRINE(LAKE) (dist. km):	E A		
19. RIVER / STREAM (dist. km):	E A		
20. OTHER PERENNIAL WATER (dist. km):	E A		
FOR CLIFF NESTS - ABOVE CLIFF: (habitat types) BELOW CLIFF:			
GROUND NEST - SITUATION:			
1. LEDGE ON CLIFF			
2. STICKNEST ON CLIFF			
3. CAVITY (POTHOLE) ON CLIFF			
4. OPEN HILLSIDE			
5. LEVEL GROUND			
6. OTHER			
CLIFF ROCK TYPE: 1. SED 2. IGN 3. MET			
SPEC. FORMATION:			
CLIFF HEIGHT (M):			
CLIFF LENGTH (KM):			
HEIGHT OF NEST ON CLIFF (M):			
ELEVATION OF NEST ABOVE SEA LEVEL (FT):			
ASPECT OF SLOPE:			
ASPECT OF NEST:			
NEST CONDITION: 1. GOOD 2. POOR 3. REMNANT ONLY			
NEST ACCESSIBILITY (to ground predators): 1. EASY 2. MOD. DIFFICULT 3. VERY DIFFICULT			
DISTANCE TO HUMAN ACTIVITY (KM):			
HUMAN ACTIVITY VISIBLE FROM NEST? 1. YES 2. NO			
TYPE(S) OF HUMAN ACTIVITY:			
1. TRAIL			
2. ROAD			
3. BOATING			
4. AIRCRAFT			
5. BUILDING(S)			
6. AGRICULTURE			
7. CONSTRUCTION			
8. RESEARCH			
9. MINING			
10. OIL / GAS			
11. LOGGING			
12. OTHER:			
CIRCLE ANY THAT APPLY:			
1. PHOTO OF CLIFF TAKEN			
2. PHOTO OF EYRIE TAKEN			
3. EYRIE DESCRIP. ATTACHED			
4. PREY REMAINS COLL.			
5. EGG(S) COLLECTED			
6. EGG SHELLS COLLECTED			
7. WHITEWASH AT EYRIE			
8. OTHER WHITEWASH ON CLIFF			
9. OVERHANG AT EYRIE			
10. AFTERNOON SHADING?			
a. YES b. NO c. UNKNOWN			
BANDING AND BAND RECOVERY INFORMATION			
AGE	SEX	AVISE NO. - COLOR / LEG	BAND CODE - COLOR / LEG

Back

Appendix B. Definition of terms.

<u>Alternate Nest:</u>	An unoccupied nest site within the nesting territory of one pair of birds.
<u>Breeding Territory:</u>	The area within which courtship, copulation, nesting and food seeking usually occur.
<u>Eyrie:</u>	The actual ledge or nest containing eggs or young used by a pair of raptors during current nesting season.
<u>Fledged Young:</u>	Young that have flown for the first time. For survey data, young that have reached 80% or more of their respective fledging age are considered fledged young.
<u>Nest Site:</u>	The actual site of the nest or ledge. More than one nest site may be present within the territory of a pair of birds but used in different years.
<u>Nest Territory:</u>	An area that contains, or historically contained, one or more nests (or scrapes) within the breeding territory of a pair of mated birds, and where no more than one pair has ever bred in any year.

Appendix C. Nesting Territory and Breeding Status Terminology.

1. Unoccupied:
A nesting territory where no bird showing an affinity for the territory during the breeding season was observed (investigators must spend a minimum of 4 hours at the territory during the incubation period to make this determination).
2. Occupancy Unknown:
A nesting territory where no bird showing an affinity for the territory during the breeding season was observed but investigators spent less than 4 hours at the territory during the incubation period.
3. Occupied--Non-breeding:
A nesting territory where one or two birds showing an affinity for the nesting territory during the breeding season were observed but no eggs were laid (note: this category requires confirmation that no eggs were laid, therefore only those nests that were frequently observed can be assigned to this category).
4. Occupied--Breeding:
An occupied nesting territory where eggs were laid (evidence includes young in nest, eggs or eggshells in nest, or adults seen incubating) but where final breeding success was not determined.
5. Occupied--Unsuccessful Breeding:
An occupied nesting territory where breeding was attempted but where no young reached 80% of its fledging age (for example, eggs destroyed or otherwise lost, eggs failed to hatch, or young hatched but died prior to fledging).
6. Occupied--Successful Breeding:
An occupied nesting territory where one or more young reached 80% of its fledging age.
7. Occupied--Breeding Status Unknown:
An occupied nesting territory where breeding or non-breeding could not be determined.
8. Occupied--Breeding Status Unknown, No Young Fledged:
An occupied nesting territory where breeding or non-breeding could not be determined but it was certain that no young fledged.

**Charley River Peregrine Falcon (*Falco peregrinus*)
Survey, 1996**

by

Carol L. McIntyre
National Park Service
Yukon-Charley Rivers National Preserve
P.O. Box 74680
Fairbanks, AK 99707

October 1996

Charley River Peregrine Falcon (*Falco peregrinus*) Survey, 1996

Prepared by:

Carol L. McIntyre, National Park Service, P.O. Box 74680, Fairbanks, AK 99707

Prepared for:

Endangered Species Office, U.S. Fish and Wildlife Service, 1412 Airport Way, Fairbanks, AK 99701

Introduction

Surveys to document the presence and nesting activities of peregrine falcons (*Falco peregrinus anatum*) have been conducted cooperatively by the U.S. Fish and Wildlife Service (FWS) and National Park Service (NPS) along the Charley River since 1980. Before 1993 surveys were conducted concurrent with other projects and observations generally occurred only at sites where peregrines were found in previous years (Ulvi, pers. comm.).

In March 1993, the FWS and the U.S. Air Force (USAF) completed formal consultation under Section 7 of the Endangered Species Act. This consultation resulted from proposed changes in USAF aircraft training operations in Alaska and possible impacts to the endangered peregrine falcon (Ambrose et al. 1994). In response to this consultation, the USAF agreed to establish aircraft exclusion zones (2 miles horizontal distance or 2,000 feet above ground level) along the following river corridors where peregrine falcons nest at high density: upper Yukon River, Charley River, Kandik River, and Porcupine River.

Because consistent survey data were limited on the Charley River, FWS and NPS personnel began intensive surveys for peregrine falcons along the Charley River in 1993 (Ambrose et al. 1994) and continued these surveys in 1994 and 1995 (McIntyre et al. 1994, McIntyre and Hander 1995.) These surveys were supported by the USAF, FWS, and NPS. The main objectives of the surveys were to locate occupied nesting territories, determine nesting activity at occupied sites, and document the number of nestlings produced along the Charley River. These data are necessary for monitoring the nesting site occupancy and reproduction of peregrines along the Charley River. This report summarizes the results of the 1996 Charley River peregrine falcon survey.

Personnel

Carol McIntyre was the principal observer. Steve Ulvi and Dave Mills, NPS, helped with observations.

Study area

The survey area included the river corridor between Gelvin's airstrip and the Yukon River

(approximately 114 river km). Surveys were limited to 0.5 km on either side of the river.

Methods

One survey was conducted along the Charley River in 1996 from 17 July to 24 July. The survey crew used a 13-foot inflatable raft (self-bailing AVON® Scout) and an inflatable kayak to travel down the river. On 17 July we flew from Fairbanks to Gelvin's airstrip via Wright's Air Service in a heliocouper fixed-wing aircraft. Two trips were necessary to transport the crew and gear. On 24 July we floated onto the Yukon and floated to Slaven's Roadhouse. On 25 July we were transported via truck by NPS personnel to Coal Creek airstrip where we boarded a chartered fixed-wing aircraft (Cessna 207, Wright's Air Service) and flew back to Fairbanks.

During the survey all sites previously occupied by peregrines and all potential nesting habitat along the river were observed from the shoreline and vantage points along the river using binoculars (10 x 40) and spotting scopes (20x - 60x). Observations were generally conducted for a minimum of 2 hours, or until we could determine if cliffs were occupied or not. When necessary, we camped close to bluffs to extend our observation periods. Observers also identified color-marked adult peregrine falcons for dispersal, movement and mortality studies.

Nesting territory locations were noted on U.S. Geological Survey topographic maps. Survey data and nest site information were recorded on Alaska Raptor Observation and Nest Record Cards (Feb. 1989) (Ambrose et al. 1994). Narrative descriptions of behavior, locations, and other observations were kept in field notebooks. Photographs were taken of all occupied cliffs. Terminology and definitions to describe nesting activities followed that recommended by Ambrose et al. (1994). Nest cards and survey maps are archived at the Endangered Species Office, USFWS, in Fairbanks, Alaska and at the Headquarters, Yukon-Charley Rivers National Preserve, Fairbanks, Alaska.

The following information was collected during the survey:

1. The number of nesting territories occupied by a pair or a single adult;
2. The number of pairs with nestlings; and,
3. The number of nestlings reaching at least 3 weeks of age.

We also recorded the time and flight level of military aircraft flying over the study area, and the occurrence and time of sonic booms heard in the study area.

Results

Seventeen occupied nesting territories were found along the Charley River in 1996 (Table 1); 16 pairs and 1 single adult were observed. We cannot calculate nesting success because no survey was conducted during incubation. However, 14 pairs of peregrines successfully produced a total

Table 1. Summary of nesting territory occupancy and reproductive success of peregrine falcons along the Charley River, Alaska, 1980 - 1996.

Year	No. of occupied sites	No. of successful sites	No. of nestlings	Nestlings/occupied site	Nestlings/successful site
1980	5	2	3	0.60	1.50
1981	4	3	8	2.00	2.67
1982	4	2	2	0.50	1.00
1983	4	3	7	1.75	2.33
1984	6	6	16	2.67	2.67
1985	6	6	15	2.50	2.50
1986	8	8	27	3.38	3.38
1987	7	7	22	3.14	3.14
1988	7	5	15	2.14	3.00
1989	9	9	23	2.56	2.56
1990	10	7	18	1.80	2.57
1991	9	7	15	1.67	2.14
1992 ^a	10	2	4	0.40	2.14
1993	11	9	21	1.91	2.33
1994	14	7	17	1.21	2.43
1995	14	9	24	1.71	2.67
1996	17	14	32	1.88	2.29

a = data is questionable due to incomplete survey in 1992. Numbers of successful nests and nestlings production may have been significantly higher.

of 32 nestlings. Productivity was 1.88 nestlings per occupied site and 2.29 nestlings per successful pair. Density of occupied nesting territories on the Charley River in 1996 averaged one pair per 6.12 km. (No cliffs or bluffs are found along the last 11 km of the Charley River. Therefore, this area is not included in this density estimate).

The age of nestlings observed during the survey ranged from 21 days of age to approximately 50 days of age. Based on the behavior of the 3 fledglings observed during the survey, we estimated that fledging had occurred with 7 days of the survey.

Three banded adult peregrine falcons were observed during the survey. The same female has been occupying the cliff 3.5 km below Copper Creek since 1994. She was originally banded as a nestling along the Yukon River at "MacGregors +2" by Skip Ambrose, USFWS. We could not read the codes on the other two banded birds because the anodized black coating had worn off the color-band.

We found one occupied golden eagle nest with one nearly-fledged nestling 3 km below Essie Creek. This is the first observation of an occupied golden eagle nest below Gelvin's airstrip since surveys began on the Charley River in 1980.

Aircraft activity

The survey period overlapped dates of a Cope Thunder flying exercise. Military aircraft were observed conducting routine training over or near the Charley on 17, 18, 19, 21, 22 and 23 July. All aircraft observed were flying at high altitudes (more than 10,000 feet AGL). Two sonic booms were recorded during the survey. The first was distant and recorded at 1654 on 18 July ~3.5 km below Copper Creek. The second was extremely loud and reverberated through the canyons at 1645 on 19 July when we were ~9 km below Crescent Creek. No reactions of peregrine falcons to aircraft were observed.

Discussion

Consistent survey data for peregrine falcons along the Charley River before 1993 are not available. Along the upper Yukon River, populations declined to a low of 11 pairs in 1973, began increasing in 1978 and has continued to increase to 45 pairs in 1996 (Ambrose, pers. comm.). Similar population trends occurred along the Charley River (Figure 1). However, due to inconsistent survey methods we cannot determine the actual rate of the increase along the Charley River. However, the number of occupied sites along the Charley River has increased from 5 in 1980 to 17 in 1996.

Density estimates of occupied nesting territories of peregrine falcons along the Charley River before 1993 are based mainly on the number of successful pairs found each year. After 1993 density estimates are based on all occupied sites found along the Charley River each year. The density estimate for 1996, one pair of peregrines per 6.12 km of river, is the highest recorded along the Charley River since surveys began in 1980.

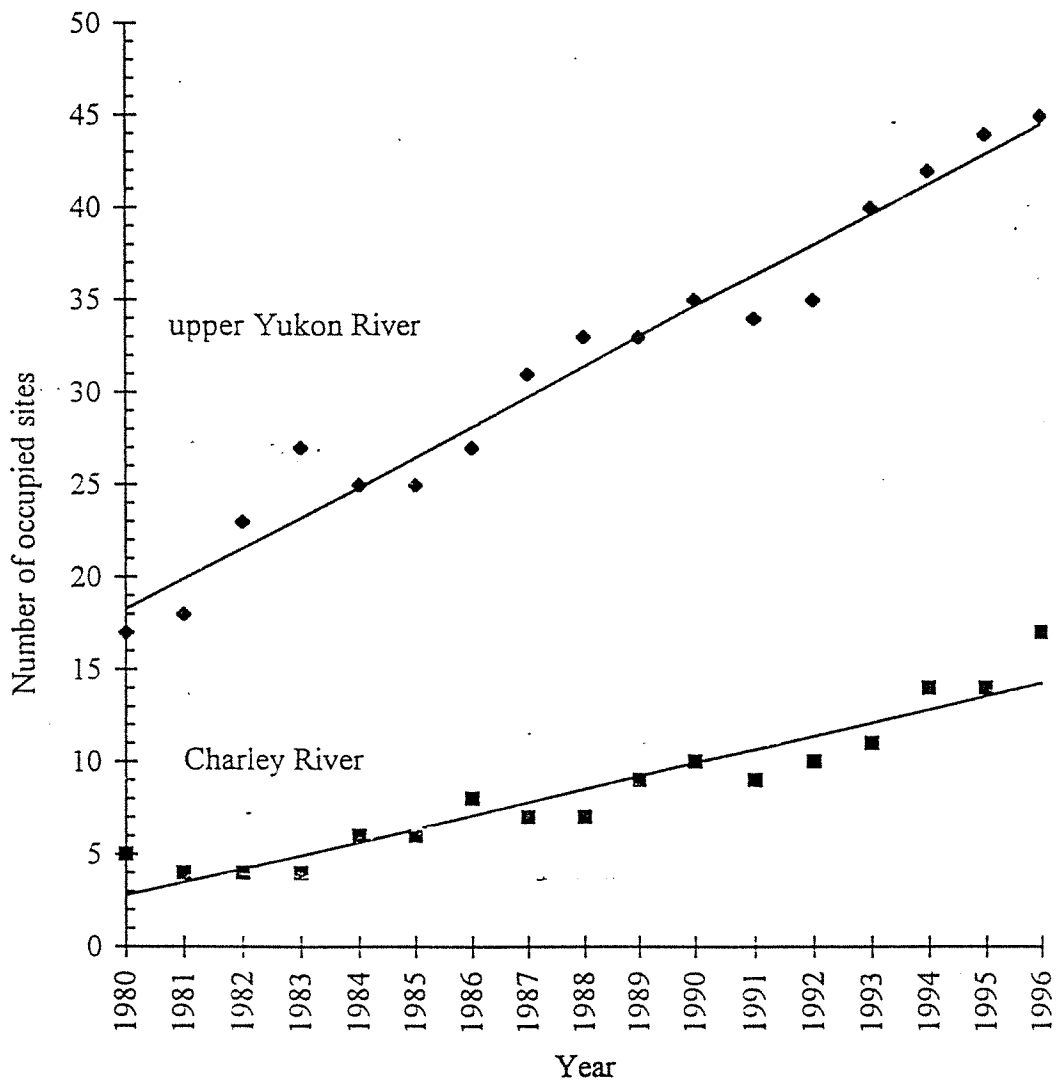


Figure 1. Comparison of trends for the number of site occupied by peregrine falcons along the upper Yukon River and the Charley River, 1980 -1996.

Recommendations

The National Park Service should cooperate with the FWS and USAF to determine a schedule for peregrine falcon surveys along the Charley River and should maintain consistent methods during these surveys. Because of the increase in military overflight activity in Yukon-Charley, the National Park Service, in cooperation with the FWS and USAF, should also develop a study to measure the occurrence of sonic booms in the Preserve, assess the long-term effects of sonic booms on peregrine falcons, and evaluate factors other than low-level aircraft that influence nesting territory occupancy, nesting success and productivity of peregrine falcons.

Acknowledgments

Funding and equipment for this survey was provided by the USFWS, Endangered Species Office. We thank the staff at Yukon-Charley River National Preserve for support during this project. In particular we thank Patty Rost, Chief of Resource Management, for supporting our participation in this survey, Joseph Chambers, River Ranger, for transporting gear, Linda Mott for helping with logistics, Pat Sanders for her "watchful ear", and Dennis Mott for transporting gear.

Literature Cited

- Ambrose, R.E. 1980. Results of peregrine falcon surveys on the upper Yukon, Charley and Colville Rivers. Alaska. Unpublished report. U.S. Fish and Wildlife Service, Office of Endangered Species, Anchorage, AK 20pp.
- Ambrose, S., J. Fadely, and C. McIntyre. 1994. Peregrine falcon surveys in military operations areas in east-central Alaska, 1993. Unpublished report. Endangered Species Office, Northern Ecological Services, Fish and Wildlife Service, U.S. Dept. Interior. 20 pp.
- McIntyre, C., K.O'Reilly-Doyle, and K. Fox. 1994. Peregrine falcon surveys on the Charley River, 1994. Unpublished report. Endangered Species Office, Northern Ecological Service, Fish and Wildlife Service, U.S. Dept. Interior, 7 pp.
- McIntyre, C. and R. Hander. 1995. Charley River peregrine falcon survey, 1995. Unpublished report. Endangered Species Office, Northern Ecological Service, Fish and Wildlife Service, U.S. Dept. Interior, 5 pp.

**Charley River Peregrine Falcon (*Falco peregrinus*)
Survey, 1995**

by

Carol L. McIntyre
National Park Service
Yukon-Charley Rivers National Preserve
P.O. Box 74680
Fairbanks, AK 99707

and

Raymond F. Hander
U.S. Fish and Wildlife Service
Kodiak National Wildlife Refuge
Buskin River Road
Kodiak, AK 99615

October 1995

Charley River Peregrine Falcon (*Falco peregrinus*) Survey, 1995

by

Carol L. McIntyre
National Park Service
Yukon-Charley Rivers National Preserve
P.O. Box 74680
Fairbanks, AK 99707

and

Raymond F. Hander
U.S. Fish and Wildlife Service
Kodiak National Wildlife Refuge
Buskin River Road
Kodiak, AK 99615

Introduction

The U.S. Fish and Wildlife Service (USFWS) and the U.S. Air Force (USAF) completed formal consultation under Section 7 of the Endangered Species Act regarding proposed changes in USAF aircraft training operations in Alaska and possible impacts to the endangered peregrine falcon (*Falco peregrinus anatum*) (Ambrose et al. 1994). Because of the consultation, the USAF agreed to establish aircraft exclusion zones around the Charley River with Yukon-Charley Rivers National Preserve. In 1993, the USFWS and the National Park Service (NPS) cooperatively conducted surveys along the Charley River to monitor peregrine falcons (Ambrose et al. 1994, McIntyre 1994). In 1995, the USFWS supported one survey of peregrine falcons along the Charley River. This report summarizes the results of the 1995 Charley River peregrine falcon survey.

Study Area and Methods

The survey area included the river corridor between Gelvin's airstrip and the Yukon River (approximately 114 river km). Surveys were limited to 0.5 km on either side of the river. We conducted one survey along the Charley River in 1995 to count the number of young and to determine the number of successful pairs. We used an inflatable raft to travel down the river. Charley. We flew from Fairbanks to Gelvin's airstrip via Wright's Air Service in a heliocouper fixed-wing aircraft on the morning of 20 July 1995. On the afternoon of 28 July 1995 we were picked up by river boat on the Yukon River at the mouth of the Charley River.

We made observations at all sites previously occupied by peregrines and all other bluffs from vantage points along the river. Observations were generally conducted for a minimum of 4 hours, or until we could determine if cliffs were occupied or not. When possible, we camped close to bluffs to extend our observation periods.

We used binoculars (10 x 40) and a spotting scope (20x - 60x) during observations. No attempts were made to enter nests in 1995 and no banding was done in 1995.

We collected the following information during the survey: 1) the number of cliffs occupied by a pair; 2) the number of cliffs occupied by a single adult; 3) the number of pairs with young; 4) the total number of young; 5) the age of nestlings; and 6) banding status of all adults.

Nest site locations were noted on U.S. Geological Survey topographic maps. Survey data and nest site information were recorded on Alaska Raptor Observation and Nest Record Cards (Feb. 1989) (Ambrose et al. 1994). Narrative descriptions of behavior, locations, and observations were kept in field notebooks. Terminology and definitions to describe nesting activities followed that recommended by Ambrose et al. (1994). Nest cards and survey maps are archived at the Endangered Species Office, USFWS, in Fairbanks, Alaska and at the Headquarters, Yukon-Charley Rivers National Preserve, Fairbanks, Alaska.

Results and Discussion

Although rainy weather prevailed throughout the survey, we made observations at 24 cliffs that were previously occupied by peregrines. We also made observations at all other cliffs along the river.

Overall, we found 13 pairs of peregrines and one lone adult peregrine. Nine pairs of peregrines produced a total of 24 young, resulting in 2.67 young per successful pair and 1.71 young per occupied site. The estimate of young per occupied site is a minimum estimate because more sites may have been occupied, but abandoned before our survey. The age of young observed during the survey ranged from 19 days of age to approximately 50 days of age. Based on the behavior of the six fledglings observed during the survey, we estimated that fledging had occurred with seven days of the survey.

The number of areas checked this year was the same as in 1994, however we cannot compare occupation in 1995 with occupation in 1994 because no incubation survey was conducted in 1995. Sites occupied during incubation in 1995 may have failed or been abandoned before our survey in 1995. Survey results from 1995, therefore, provide a minimum estimate of peregrine occupation along the Charley River. Similarly, nesting success could not be determined because no survey was conducted during the incubation stage in 1995.

Density in 1995 was one pair every 6.93 km (104 km/15 occupied sites); this showed no change since 1994. The last 11 km of river is not included in this density estimate because there are no suitable nesting sites along this stretch of river.

Many sites occupied in 1994 were occupied in 1995, however sometimes the occupied cliffs were not the identical sites as in 1994. For instance, birds were found at a different cliff that was within 2 km of the cliff where they were found in 1994. We assumed that these cliffs were close enough to each other to be used by the same pair of birds in different years. One site not occupied in 1994 was occupied in 1995 and one site occupied in 1994 was not occupied in 1995. We found an eyrie at Highland Creek that had not been occupied since 1990. Peregrines were not found on the large bluff between Hosford Creek and Crescent Creek, however we found recently fledged gyrfalcons on this bluff. Because we conducted our surveys late in the nesting season, peregrines may have occupied this site earlier, but abandoned before our survey.

One banded adult was observed and we reported the band code to the USFWS Endangered Species Office, Fairbanks, Alaska. Many more banded adults may occur along the Charley River, however, we cannot always get a good look at the bird's legs to see if they are banded or not.

We observed military aircraft every day during the survey period. We did not encounter any low flying military aircraft. We did not encounter any recreational floaters during the survey period.

Recommendations

1. All federal agencies, including the NPS, have mandated and legal obligations to conserve and monitor species listed as endangered and threatened under the Endangered Species Act. Additionally, the USAF is required to monitor the incidental take of peregrine falcons as specified in the March 31, 1993 Biological Opinion between the USFWS and the USAF. To fulfill these responsibilities, a cooperative monitoring effort between the USFWS, USAF, and the NPS should continue until a monitoring program is no longer required (Ambrose et al. 1994). In the best interest of protecting peregrine falcons along the Charley River, the NPS should work cooperatively with the USFWS and the USAF on future monitoring efforts.
2. To determine occupancy of nesting territories, nesting success and productivity based on occupied sites, two annual surveys must be conducted along the Charley River. The first survey must be conducted during the incubation stage (late May-early June) to find pairs and to count the number of pairs with eggs. The second survey must be conducted during the nestling stage (early to late July) to count young and determine nesting success. Estimates of productivity should be based on occupied sites, not solely on successful pairs, because even during periods of depressed productivity successful pairs may produce normal numbers of young. If time or funding do not allow for two surveys, one survey should be conducted during mid to late July to count young and successful pairs.

3. To maintain consistency in data collection at individual sites among years, a mileage system should be developed to identify the location of bluffs along the Charley River. The mileage system should be compatible with the river mileage system currently used by the USFWS, Endangered Species Office, Fairbanks.
4. Surveys should be conducted by experienced personnel and survey methods should follow guidelines established by the USFWS, Endangered Species Office, Fairbanks. It is essential that investigators spend enough time at each bluff to determine occupancy and breeding activities. Accurate determination of occupancy, breeding status, and production of young are essential to monitor the peregrine falcon population along the Charley among years. Efforts must be made to complete each survey because incomplete survey results (e.g., missed counts of young) will make it impossible to assess reproduction of peregrine falcons along the Charley River over time.

Acknowledgments

The U.S. Air Force and the Fish and Wildlife Service provided funding for this survey. The NPS and the USFWS, Kodiak NWR, provided personnel to conduct this survey. We thank Dave Stevens, NPS, and Tony Chatto, Kodiak NWR, for supporting our participation in this survey.

Literature Cited

- Ambrose, S., J. Fadely, and C. McIntyre. 1994. Peregrine falcon surveys in military operations areas in east-central Alaska, 1993. Unpublished report. Endangered Species Office, Northern Ecological Services, Fish and Wildlife Service, U.S. Dept. Interior. 20 pp.
- McIntyre, C. 1994. Peregrine falcon surveys on the Charley River, 1994. Unpublished report. Endangered Species Office, Northern Ecological Service, Fish and Wildlife Service, U.S. Dept. Interior, 7 pp.

Final Report

**RESULTS OF RAPTOR SURVEYS
ON THE TANANA RIVER AND IN YUKON MOAs 1-5, ALASKA,
1996**

Prepared for
U.S. Fish and Wildlife Service
1412 Airport Way
Fairbanks, Alaska

Prepared by
Robert J. Ritchie,
and
John Rose

ABR, Inc.
P.O. Box 80410
Fairbanks, Alaska 99708

6 February 1997

TABLE OF CONTENTS

LIST OF TABLES	i
LIST OF FIGURES	ii
ACKNOWLEDGMENTS.....	ii
INTRODUCTION.....	1
STUDY AREA.....	2
METHODS.....	2
METHODS.....	2
RESULTS AND DISCUSSION.....	5
SPRING AND SUMMER CONDITIONS	5
PEREGRINE FALCONS.....	5
TANANA RIVER.....	5
YUKON MOAS 1 AND 2	8
BALD EAGLES.....	8
TANANA RIVER.....	8
YUKON MOAS 1-5.....	11
SUMMARY	14
LITERATURE CITED.....	15
PERSONAL COMMUNICATIONS	15
APPENDICES.....	16

LIST OF TABLES

Table 1. Peregrine Falcon occupancy and productivity of sites on Tanana River, Tetlin Bridge to Fairbanks, Alaska, 1996.....	6
Table 2. Historical occupancy and productivity of Peregrine Falcons, Tanana River, Alaska, 1968-1996.....	7
Table 3. Number of nest sites by drainage used by Peregrine Falcons in YUKON MOAs 1-2, Alaska.....	9
Table 4. Distribution and status of Bald Eagle nests checked during aerial survey, Yukon MOAs Study Area, Alaska, 1996.	12

LIST OF FIGURES

Figure 1. Tanana River and Yukon MOAs raptor study area, Alaska, 1996.	3
Figure 2. Distribution and status of Peregrine Falcon sites recorded during aerial surveys in the YUKON MOAs 1–5, Alaska, 1994–1996.	10
Figure 3. Distribution of Bald Eagle nests recorded during aerial surveys on the Tanana River and in the YUKON MOAs 1–5, Alaska, 1994–1996.	13

LIST OF APPENDICES

Appendix 1. Peregrine falcon nest sites and status, Tanana River and Yukon MOAs 1–5, 1994–1996.	17
Appendix 2. Bald Eagle nest site location and status, Tanana River and Yukon MOAs 1–5, Alaska, 1994–1996.	21
Appendix 3. Banding schedule, Peregrine Falcons, Tanana River and Yukon MOAs 1–5, Alaska, 1996.	25

ACKNOWLEDGMENTS

This project was funded by the U.S. Fish and Wildlife Service (USFWS), Office of Endangered Species. Skip Ambrose and Ted Swem were helpful throughout the project. Chris Soloy, Soloy Helicopters, and Bill Lynch, Tamarack Air, provided aircraft support. Peter Alden and Bobbie Ritchie assisted with data collection. Steve Murphy, ABR, Inc., provided internal review of drafts. Allison Zusi-Cobb, ABR, assisted with map and GIS database preparation and Cecilia Brown, ABR, processed the manuscript.

INTRODUCTION

In 1996, ABR conducted surveys for Peregrine Falcons and Bald Eagles for the U.S. Fish and Wildlife Service (USFWS) and the U.S. Air Force (USAF). The purpose of these surveys was to complement existing programs supported by the USAF to locate and assess the status of raptor nest sites in Military Operation Areas (MOAs) where the Air Force conducts low-level training activities, as well as to provide assistance for USFWS-supported annual monitoring activities along the Tanana River. Areas of interest for the USAF included the YUKON MOAs 1, 2, 3, 4, and 5.

The specific objectives of this project were:

1. to locate raptor nest sites, primarily Peregrine Falcon and Bald Eagles in the YUKON MOAs and along the Tanana River, from Tok to Fairbanks; and
2. to determine occupancy, breeding success, and productivity for nests in these areas.

The USFWS initiated surveys in 1993 in YUKON MOAs 1 and 2, designed to identify off-river nest sites of raptors for long-term monitoring (S. Ambrose, USFWS, pers. comm.). Since 1994, ABR, as part of a research team with the Alaska Cooperative Wildlife and Fisheries Research Unit (ACWFRU), supported by the USAF's Armstrong Laboratory for their study "Effects of Aircraft Overflights on Birds of Prey," and by the 11th Air Force in Alaska, has continued to search for and monitor off-river sites in YUKON MOAs 1-5.

The 1996 effort again was coordinated with existing monitoring programs conducted by the USFWS along the Yukon and Charley rivers (Ambrose 1994), as well as the ACWFRU field crews documenting the behavior of Peregrine Falcons on the Tanana River for the research program noted above. A detailed annual report will be prepared for the USAF Armstrong Lab's program that will summarize our data on remote, off-river raptor sites. In keeping with a similar format for annual reports for the Tanana River, the following report primarily summarizes information on Peregrine Falcons and Bald Eagles in this area, with relevant notes on additional survey areas.

STUDY AREA

The study area included the upper Tanana River between Tok and Fairbanks and portions of YUKON MOAs 1 and 2 in east-central Alaska (Figure 1). Survey areas in the MOAs included portions of the Healy, Birch Creek, Black River and the Eastern Crazy Mountains, and upland areas in the Tanana-Yukon Uplands between the Tanana and Yukon rivers and in the Porcupine Plateau between the Yukon and Black rivers (Wahrhaftig 1965). The Tanana River portion of the study area included riparian cliffs and floodplains adjacent to the Tanana River.

Rounded, even-topped ridges characterize the Tanana-Yukon Uplands with compact, rugged mountains (1200–1500 m [3960–4950 ft] in elevation) surmounting this more gentle terrain (Wahrhaftig 1965). Low ridges with gentle slopes and rounded summits (450–750 m [1485–2475 ft] in elevation) dominate the Porcupine Plateau; non-riparian cliff structures are limited. Scattered cliffs of granite and schist rise above the outwash plains along the Tanana River.

Potential nesting habitats include volcanic and sedimentary cliffs from 50 m (165 ft) to 150 m (495 ft) in the upper Black River and Birch Creek drainages and isolated tors and limestone ridges in the Eastern Crazy Mountains. Cliffs along the Tanana River range from 25 m (80 ft) to >200 m (660 ft).

METHODS

METHODS

We used a combination of helicopter, fixed-wing, and inflatable raft-supported surveys to locate nests and monitor their occupancy and productivity in the study areas. Standard procedures and terminology have been described in Ritchie and Rose (1994). Definitions generally followed those described in the National Wildlife Federation's Raptor Management Techniques Manual Steenhof (1987). Specific definitions regarding occupancy of nesting territories included: breeding (incubating adult), occupied (pair present), and successful (large nestlings [~80% of average age at fledging] present). For each survey, we recorded all raptor sites on USGS 1:63,360 maps. Additionally, we used an onboard GPS during aircraft surveys. After surveys, location data were entered on GIS base maps with AutoCad Software. Nest record cards were completed for each newly identified and occupied Peregrine Falcon nest site in YUKON MOAs 1 and 2. Specific surveys included:

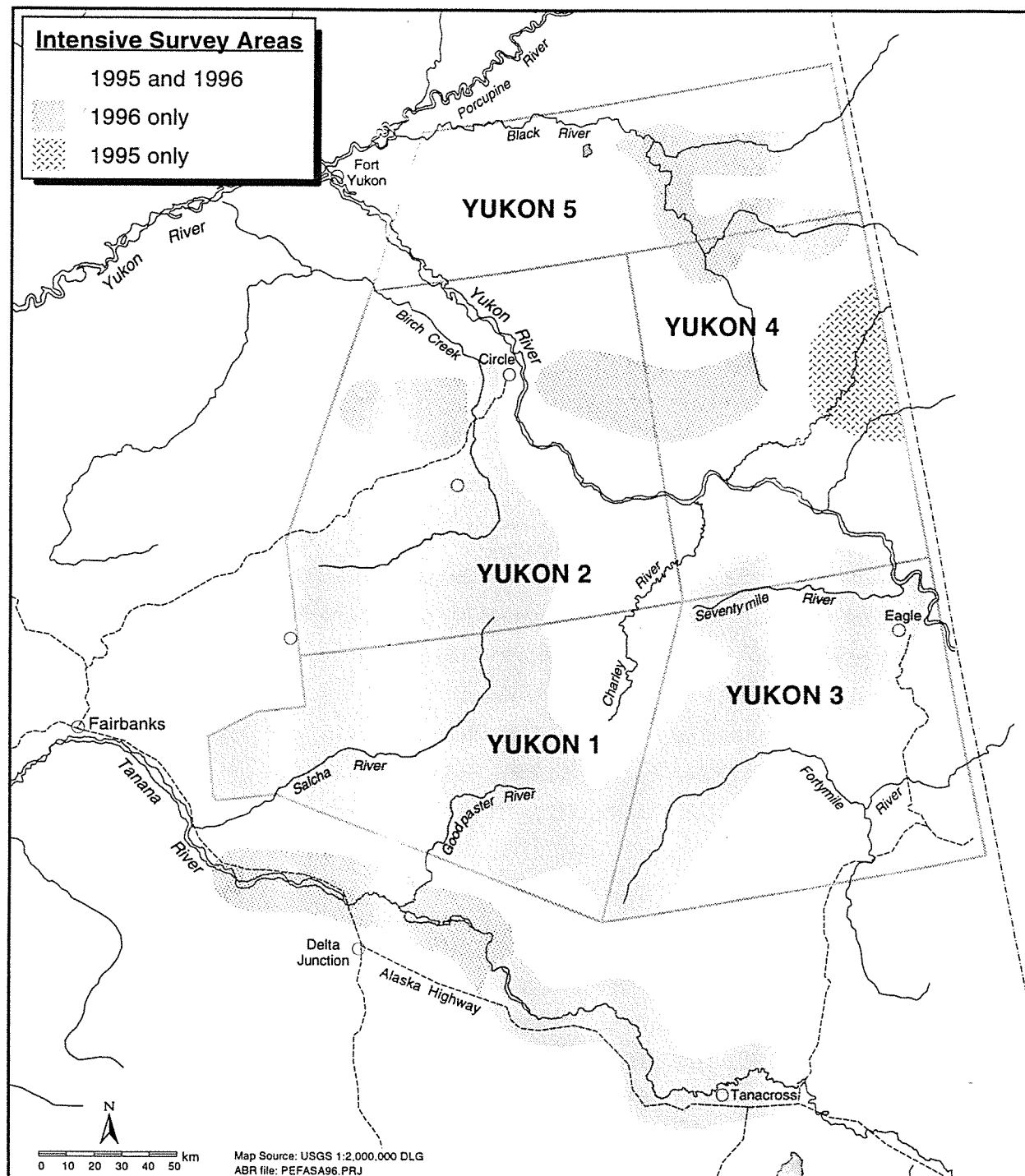


Figure 1. Tanana River and Yukon MOAs raptor study area, Alaska, 1996.

1. *Helicopter survey for Occupancy, Cliff-nesting raptors (26 May–2 June), YUKON MOAs 1–5.* A Hughes 500 helicopter with two observers was used to visit known and potential raptor nests in the YUKON MOAs 1–5. For this project, areas not previously covered during our annual surveys for the USAF, and primarily within YUKON MOAs 1 and 2 (e.g., Eastern Crazy Mountains, west of Birch Creek, and the Healy River), were visited.
2. *Fixed-wing aircraft survey for Occupancy, Bald Eagles (May), Tanana, Salcha, Birch, and Black Rivers.* A Cessna 185 with one observer was used for pre-leaf out-surveys along the Tanana River floodplain from the Robertson River to Nenana. A supercub aircraft with one observer was used for a similar survey on drainages in MOAs 1, 2, 4 and 5. Aircraft were flown at <100 m and at airspeeds of ~85–110 k along each drainage. Generally, known nest sites, identified by previously recorded GPS locations, were visited; however, additional sites were identified during these surveys.
3. *Boat Survey for Productivity Monitoring of Peregrine Falcons (5–10, 19 July), Tanana River.* Peregrine Falcon nest sites along the Tanana River between Tok and Nenana were visited in early May (P. Bente, ADFG, pers. comm.). We revisited onriver sites between Tok and Fairbanks in early July to count and band young. We used techniques similar to those used at remote sites to determine the occupancy and success of each site (Ritchie and Rose 1994). A minimum of two hours were taken at all sites where Peregrines had been recorded during visits in May. Information from occupancy checks in early- to mid-May were used in determining the level of effort expended at some sites.
4. *Helicopter Survey for Productivity, Cliff-nesting raptors and Bald Eagles (12–17 July), YUKON MOAs 1–5.* Nest sites located during aircraft-supported occupancy surveys in May and June were visited to count young. Peregrine Falcon nest sites were visited to band young, collect prey remains, and measure young. Measurements of nestlings include weight, wing chord, tarsal length, length of 7th primary, and length of central retrices were taken for the ACWRU project.

RESULTS AND DISCUSSION

SPRING AND SUMMER CONDITIONS

Weather conditions in the study area generally were near normal during the main months of breeding (May–July). Temperatures were slightly warmer during early incubation and brood-rearing (+ 0.6 and 0.5 degrees F in May and July, respectively) and cooler in June (- 0.3 degrees F) (unpublished Climatological Data-Monthly Summary, National Weather Service, Fairbanks, AK, R. Settje, Forecaster, U.S. Weather Bureau, Fairbanks). Dry conditions prevailed during arrival and early incubation; only trace amounts of precipitation were recorded during May (unpublished Climatological Data-Monthly Summary, National Weather Service, Fairbanks, AK). Localized, heavier rains occur regularly in the uplands, thereby complicating a discussion on the influence of precipitation during any breeding season. However, low water levels on remote drainages through the summer suggest fewer storm events in 1996.

PEREGRINE FALCONS

TANANA RIVER

A minimum of 26 pairs and 5 single birds occupied cliffs along the Tanana River between the Tetlin Bridge (Tok) and Fairbanks, Alaska in 1996 (Table 1). Cliffs downriver from Fairbanks and off-river cliffs north of Dot Lake were not surveyed. Some of these cliffs have regularly been used by Peregrine Falcons (Bente and Wright 1994, 1995). In 1995, at least 30 pairs and two single birds occupied cliffs in the area surveyed during our investigations (P. Bente, ADFG, pers. comm.). In the past five years, numbers of pairs have ranged from 20–34 pairs on the Tanana River, Tok to Nenana (Bente and Wright 1995).

At least 17 pairs (65%) were successful in producing young. At four of these sites, young were small (<10 days old) during our visit in mid-July, but later visits verified the same number of larger young (>20 days old) at three of the four sites; the fourth site was not revisited. We have included all four sites in an estimate of productivity for 1996. Eggs or eggshells were discovered at two additional sites that were not successful in producing young. Success at Peregrine Falcon sites along the Tanana River has ranged from 64–89% between 1991–1995 (Bente and Wright 1995; Table 2).

Forty-four young were produced at 17 successful nest sites for an average brood size of 2.59 young/successful pair (1.69 yg/occupied site) in 1996. Productivity in the

Table 1. Peregrine Falcon occupancy and productivity of sites on Tanana River, Tetlin Bridge to Fairbanks, Alaska, 1996.

USFWS Nest #	Location	Occupancy ¹ (May) # Adults	Productivity (July)	
			# Adults	# yg
103.0	Tok River	2	1	2
135.0	VABM SAMO	1	0	0
181.0	Above Cathedral Rapids	1	0	0 ⁴
205.0	Tower Bluffs	2	0	0
211.0	Offriver, Tower Rapids	2	2	0 ³
221.5	Round Lake	3 ²	2	4
243.0	Billie Creek	2	2	0
244.5	Downstream Billie Creek	0	1	0
247.0	Downstream Billie Creek	2	2	1
258.5	Upstream Johnson Slough	1	2	2
269.5	Downstream Johnson Slough	2	2	4
280.5	Downstream George Lake Boat L.	2	2	3
281.6	Downstream George Lake Boat L.	1	0	0
282.0	George Lake Outlet	2	0	0
288.5	Downstream Little Gerstle	2	2	2
299.0	Upstream Saw Mill	2	2	3
320.0	Downstream Healy River	2	2	3
336.5	Downstream Volkmar River	2	1	0
371.0	Goodpaster	2	2	2
376.0	Indian Ck.	2	2	3
380.0	Upper Delta	2	2	3
386.0	Delta Bridge	2	0	0
405.0	Shaw Creek	2	0	0
408.0	Beneath Shaw Creek	2	2	2
414.5	Richardson Delta Creek	1	2	4
427.0	Canyon Creek	2	2	3
431.0	Lower Canyon Creek	2	2	0
436.5	Birch Lake	2	2	1
438.5	Mitchell Bluff	2	2	2
443.0	VABM Hill	2	0	0 ⁴
459.5	Flag Hill	1	1	0
Total Occupied Sites		26 (pair recorded on at least 1 survey)		
Total Successful Sites		17		
Total Number of Young		44		
Young/Occupied Site		1.69		
Young/Successful Site		2.59		

¹Includes observations from May survey results (P. Bente, ADFG, pers. comm.).

²3 birds observed at site; 2 adults and 1 subadult (not interloper) on May survey.

³Reproductive status unknown; defensive pair present, but strongest affinity to cliffs 0.5 to 1.0 km downriver of 1995 site.

⁴Abandoned eggs or eggshell fragments.

Table 2. Historical occupancy and productivity of Peregrine Falcons, Tanana River, Alaska, 1968–1996.

Year ^a	Occupancy			Productivity		
	Lone Adults	Total Pairs	Successful Pairs	Number of Young	Young Per Total Pair	Young Per Successful Pair
1968	0	12	11	23	1.92	2.09
1970	0	6	6	16	2.67	2.67
1971	0	4	3	9	2.25	3.00
1972	0	4	3	7	1.75	2.33
1973	0	4	4	8	2.00	2.00
1974	0	2	1	1	0.50	1.00
1975	1	2	0	0	0.00	--
1976	2	0	0	--	--	--
1977	0	3	1	1	0.33	1.00
1978	0	4	3	6	1.50	2.00
1979	3	3	2	4	1.33	2.00
1980	0	4	2	5	1.25	2.50
1981	0	5	5	12	2.40	2.40
1982	0	5	3	8	1.60	2.67
1983	0	5	4	11	2.20	2.75
1984	1	4	2	4	1.00	2.00
1985	0	4	3	5	1.25	1.67
1986	2	5	4	12	2.40	3.00
1987	0	8	5	10	1.25	2.00
1988	1	12	9	16	1.33	1.78
1989	0	15	11	29	1.93	2.64
1990	3	15	9	29	1.93	3.22
1991	0	20	16	38	1.90	2.38
1992	3	25	16	38	1.56	2.44
1993	1	26	19	62	2.38	3.26
1994	1	27	24	74	2.74	3.08
1995	2	34	25	65	1.92	2.60
1996 ^b	5	26	17	44	1.69	2.59

^a Data for 1968–1978 from a review by Roseneau et al. 1981. Data for 1979–1990 from USFWS, Endangered Species, Fairbanks, Alaska, unpublished summaries. Data for 1991 from Bente and Wright 1992. Data for 1992 from Bente and Wright 1993. Data for 1993 from Bente and Wright 1994. Data from 1994 Bente and Wright 1995. Data for 1995 from Bente, unpublished table.

^b Did not include sites beneath Fairbanks and offriver sites on the upper Tanana River (Site No. 232.5, 236, and 93.5).

previous five years ranged from 2.38–3.08 yg/successful pair (1.56–2.74 yg/total pair) (Bente and Wright 1995; P. Bente, ADFG, pers. comm.).

YUKON MOAS 1 AND 2

Aerial surveys have been undertaken at remote locations (off-river) in YUKON MOAs 1–5 since 1993 (McIntyre et al. 1993, Ritchie and Rose 1994, Ritchie et al. 1996). Additional surveys, primarily by boat, have also occurred along some of the major drainages in the MOAs (e.g., Kandik River, Fadely and Fadely 1993). In 1996, we found 13 new Peregrine Falcon sites (i.e., pairs, incubating adult, young present, or occupied by at least one defensive adult) in MOAs 1 and 2 on surveys during May and July (Table 3). At least 39 sites have records of use in these two MOAs (White and Streater 1970; McIntyre et al. 1993, Ritchie and Rose 1994; Ritchie et al. 1996). All Peregrine Falcon sites recorded during these surveys in Yukon MOAs 1–5 are shown in Figure 2 (Appendix 1).

YUKON MOA 1. The Healy River was searched for occupied cliffs during May. Two cliffs determined to be unoccupied in 1994 were occupied by birds in 1996 (single and a pair); the pair was successful (2 yg). This cliff was not occupied in 1994 (Ritchie and Rose 1994). Upland cliff sites between the Salcha and Goodpaster, last surveyed in 1994, were not visited in May due to bad weather.

YUKON MOA 2. Surveys were conducted for the first time in 1996 in the Eastern Crazy Hills in the Birch Creek drainage. Peregrines were recorded at six cliffs in this area: One single and five pairs. Four pairs were successful (2.75 yg/successful pair). Most (67%) nest sites were located on large cliffs and outcroppings near treeline, similar to cliffs used by peregrines in the White Mountains (Kuopat 1986).

In addition, the southernmost drainages of the Black River were visited in July. Cliffs are limited in the region to the headwaters of small tributaries, but provide good structure for cliff-nesting raptors. Peregrines were located at three of these cliffs during a mid-July visit (two not previously surveyed [one nest, 4011, is in MOA 4]). All three pairs were successful (2.0 yg/successful pair). (Information on other new sites for all survey areas in MOAs 3–5 will be summarized in the annual report to the USAF.)

BALD EAGLES

TANANA RIVER

Pre-leaf-out aerial surveys for Bald Eagles were undertaken on the Tanana River, Birch Creek, Salcha River and Black River in 1996. In addition, the occupancy of four nest sites on the Tanana River between the Robertson River and Tetlin Bridge was

Table 3. Number of sites by drainage used by Peregrine Falcons in YUKON MOAs 1-2, Alaska^a.

MOA	Drainage	Known Sites (prior to 1996)	New Sites (1996)	Total Estimated Sites
YUKON 1	Chena ^b	1	0	1
	Salcha	9	0	9
	Goodpaster/Healy	2	4	6
	Subtotal MOA 1	12	4	16
YUKON 2	Birch ^c	13	8	21
	Black	1	1	2
	Subtotal MOA 2	14	9	23
TOTAL MOA 1 and 2		26	13	39

^aNesting (e.g., incubating adult, eggs or young).

^bChena site recorded in White and Streater (1970).

^cIncludes Crazy Hills.

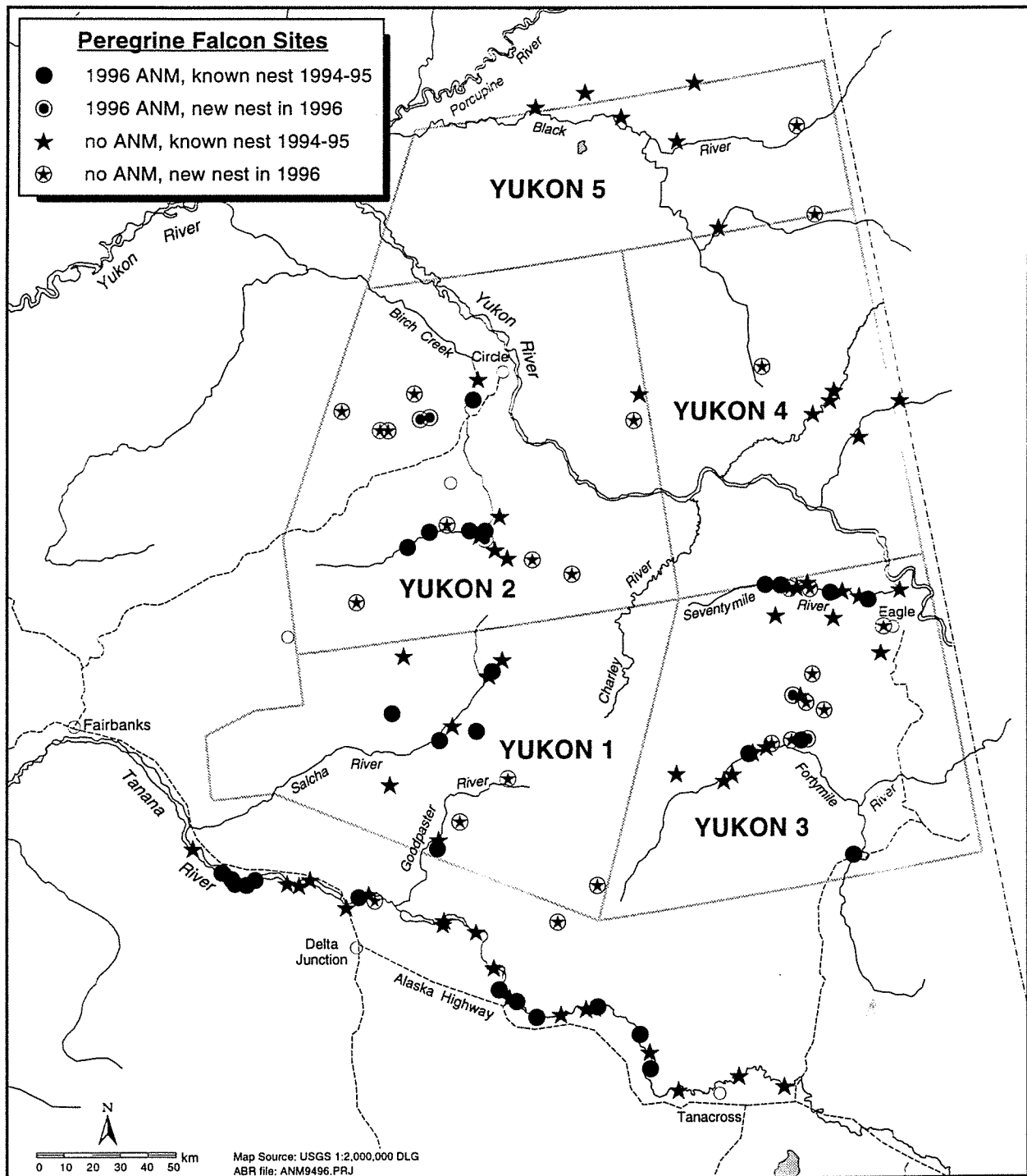


Figure 2. Distribution and status of Peregrine Falcon sites recorded during aerial surveys in the YUKON MOAs 1–5, Alaska, 1994–1996.

determined during boat surveys; a fifth site on the middle Tanana, not located by aircraft surveys, also was visited by boat. More detailed summaries of information on other rivers will be included in the annual report for USAF, but a brief overview is described in this report.

Fifty-three Bald Eagle nesting territories were surveyed during May and June (including offriver sites on Healy Lake and George Lake). Twenty-nine nesting territories, including 26 in which incubating adults or young were observed, were occupied on the Tanana River; nests could not be located in four territories. A minimum of 19 nesting pairs were successful (two active nests downriver from Fairbanks were not revisited during July productivity surveys) along the Tanana River. Thirty-one nestlings were recorded at these sites for an average of 1.63 yg/successful pair. Mean productivity along the Tanana for the period from 1978–1990 was similar: 1.57 yg/successful pair (Ritchie and Ambrose 1996).

The best data for multiyear comparisons exists for the portion of the Tanana River between Tok and Delta Junction, where surveys have been conducted consistently and where the drainage is constricted, allowing for comparable annual survey results. In 1996, 14 pairs were recorded during May surveys at nest sites in this region. Numbers of occupied sites have increased in this area since surveys were initiated (6–13 pairs, 1978–1994; Ritchie and Ambrose 1996).

YUKON MOAS 1–5

Sixty Bald Eagle nests were checked for occupancy during 1996 surveys in Yukon MOAs 1–5. At least 71 Bald Eagle nests have been recorded in the YUKON MOAs 1–5 during surveys since 1994 (Ritchie and Rose 1994; Ritchie et al. 1996; Figure 3). Ten new locations were mapped in 1996 (Table 4). Overall, 47% of nest territories were occupied and active in this region. Only 12 of these nests were successful, however, producing 1.5 yg/successful nest. Table 4 summarizes information for each drainage.

Of interest was the first documented successful nesting by Bald Eagles along the Black River. Numerous platforms have been identified there (Ritchie 1984; Ritchie and Rose 1994), but no successful nests have been identified in either of those two survey years, 1984 and 1994. At least three nests produced 1.0/yg nest in 1996.

Table 4. Distribution and status of Bald Eagle nests checked during aerial survey, Yukon MOAs 1-5, 1996.

Location	Number of Known Nests	New Nests	Total Nests	Nests Checked	Occupied (% occupied)	Successful (% successful)	yg/ Successful Nest
Birch Creek	5	1	6	4	4 (100)	3 (75)	1.67
Black River	34	6	40	40	14 (33)	3 (33) ^a	1.00
Salcha River	9	3	12	12	9 (75)	5 (63) ^b	1.60
Goodpastor River	1	0	1	0	nd ^c	nd	nd
Forty Mile River	10	0	10	3	1 (33)	1 (33)	2.00
70 Mile River	1	0	1	1	0 (0)	0 (0)	(-)
Nation River	1	0	1	0	nd	nd	nd
TOTAL	61	10	71	60	27 (47)	12 (55)	1.50

^a Only 9 nests checked for productivity check.^b Only 8 nests rechecked for productivity check.^c nd = no data.

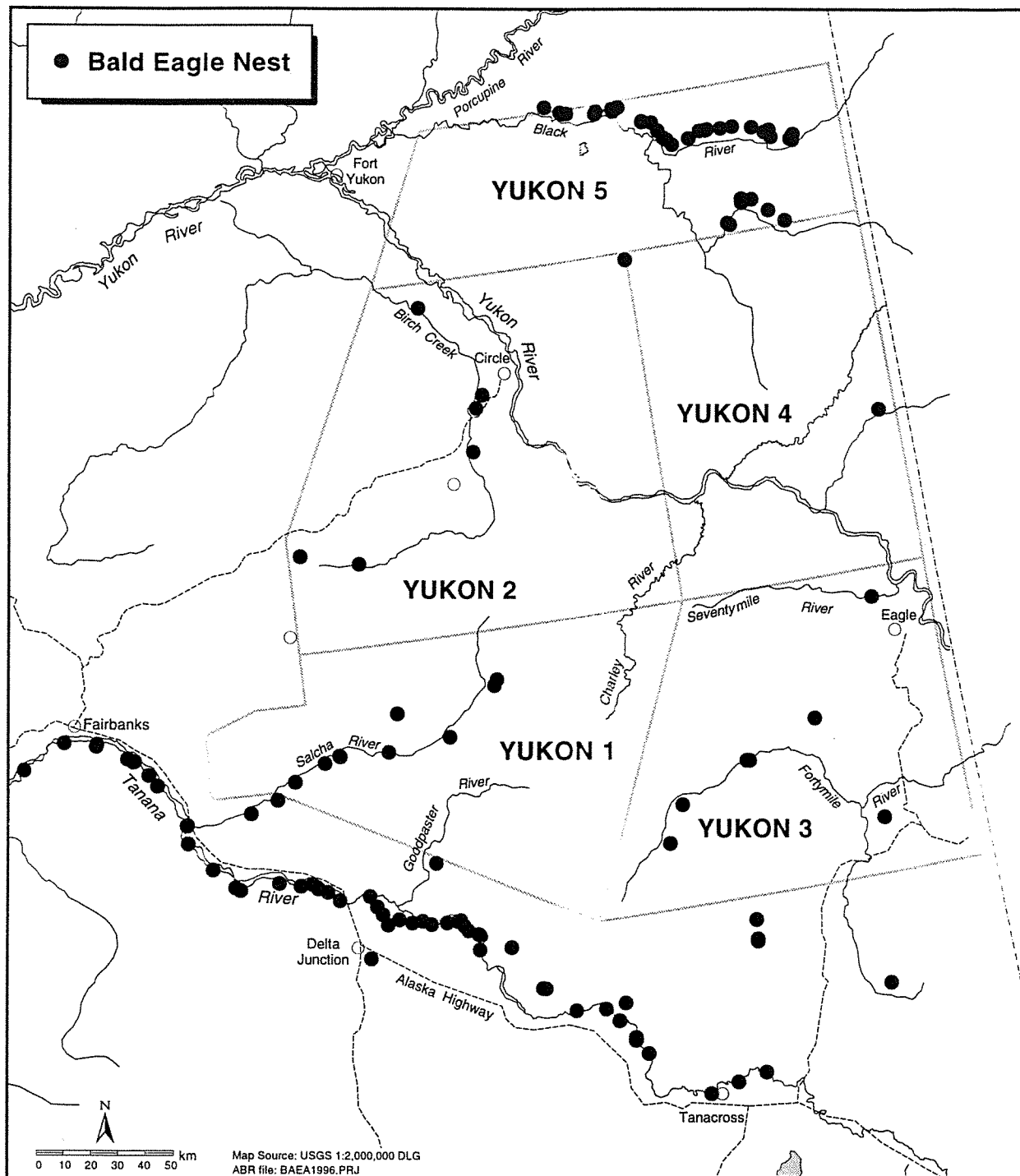


Figure 3. Distribution of Bald Eagle nests recorded during aerial surveys on the Tanana River and in the YUKON MOAs 1–5, Alaska, 1994–1996.

SUMMARY

Peregrine Falcons occupied the majority of traditional sites between Tok and Fairbanks in 1996. Breeding success and productivity (% successful pairs per total pairs) was lower than the high recorded in 1994, but within the range of historical records. The presence of unoccupied cliffs suggests that potential habitat is still available. At least one cliff site, lacking a history of use, was occupied (across from the mouth of the Goodpaster River).

The location of new nest sites in upland regions on the Healy River and in the Eastern Crazy Mountains was not a surprise, since these areas include habitats similar to those used in adjacent upland areas and these areas have not been surveyed or surveyed recently. Identification of additional occupied sites in regions annually surveyed (e.g., Birch Creek), however, suggest that "recovery" is still proceeding in the region. Some cliff habitats in MOAs 1 and 2 have still not been surveyed adequately or recently, including tributaries of the upper South Fork of Birch Creek and in upland areas between the Salcha and Goodpaster rivers.

Bald Eagle occupancy and productivity was normal for nests along the Tanana River. Breeding success and productivity (nestling/successful pairs) was lower in YUKON MOAs 1-5 than along the Tanana River. The Salcha, Goodpaster, Fortymile, and Seventymile rivers, and Birch Creek drainages have been surveyed well for Bald Eagles. Portions of the Black, Nation and Kandik rivers require additional coverage, however.

LITERATURE CITED

- Ambrose, R. E. 1994. American Peregrine Falcons along the Upper Yukon River, Alaska, 1994. Prep. U.S. Air Force, Eielson AFB, Alaska; prep. by U. S. Fish and Wildlife Service, Fairbanks, AK. 11 pp.
- Bente, P., and J. M. Wright. 1994. Documentation of Peregrine Falcon nest sites in relation to state land use proposals. AK. Dept. Fish and Game. Grant SE 2-8. 41 pp.
- Cade, T. J. 1960. Ecology of the peregrine and gyrfalcon populations in Alaska. Univ. California Publ. Zool. 63:151-290.
- Fadely, J. B., and B. S. Fadely. 1993. Kandik River Peregrine Falcon survey, 1993. Prep. by U.S. Fish and Wildlife Service - Endangered Species. Fairbanks, AK. 21 pp.
- Kuropat, P. 1986. 1986 raptor surveys along rivers in the Yukon Resource Area, Alaska. Unpubl. report for Bureau of Land Management, Fairbanks, AK. 3 pp.
- McIntyre, C. L., R. E. Ambrose, and J. B. Fadely. 1993. Peregrine Falcon surveys in the Yukon-Tanana Uplands: upper Salcha, Chena, Goodpaster, Healy, and Fortymile Rivers, and upper Birch Creek, 1993. Unpubl. draft report for U.S. National Park Service and U.S. Fish and Wildlife Service - Office of Endangered Species Office. 4 pp.
- Ritchie, R. J. 1984. The results of raptor surveys along the Porcupine River and Salmon Fork of the Black River, Alaska, 1984. Unpubl. report for U.S. Fish and Wildlife Service, Anchorage, AK. 17 pp. + appendices.
- Ritchie, R. J., and J. R. Rose. 1994. Peregrine Falcon and other raptor surveys in the Yukon MOAs 1-5, Alaska, 1994. unpubl. Final Report prepared for USAF 611 ASG/LGV, Elmendorf AFB, AK. 22 pp.
- Ritchie, R. J., and R. E. Ambrose. 1996. Distribution and population status of Bald Eagles (*Haliaeetus leucocephalus*) in Interior Alaska. Arctic 49: 120-128.
- Steenhoff, K. 1987. Assessing raptor reproductive success and productivity. Pages 157-170 in Pendleton et al. (eds.) Raptor Management Techniques Manual. National Wildlife Federation, Scientific and Technical Series No. 10.
- Wahrhaftig, C. 1965. Physiographic divisions of Alaska. U.S. Geological Survey Professional Paper No. 482:1-52.

PERSONAL COMMUNICATIONS

- Settje, R., Forecaster, U.S. Weather Bureau, Fairbanks, Alaska.
- Ambrose, R. E., Biologist, U.S. Fish and Wildlife Service - Office of Endangered Species, Fairbanks, Alaska.
- O'Reilly-Doyle, C., Biologist, U.S. Bureau of Land Management, Tok, Alaska.

APPENDICES

Appendix 1. Peregrine falcon nest sites and status, Tanana River and Yukon MOAs 1-5, 1994-1996¹.

Location	NEST	Drainage	Species	STAT 94 ²	STAT95-1	STAT95-2	STAT 96-1	STAT 96-2	Latitude	Longitude
TANANA	103	Tanana	PEFA	nd	nd	nd	nc	2yg	63° 21.9"	142° 49.33"
TANANA	135	Tanana	PEFA	nd	nd	nd	nc	single adult	63° 25.41"	143° 8.32"
TANANA	181	Tanana	PEFA	nd	nd	nd	nc	unoccupied	63° 24.58"	143° 36.08"
TANANA	205	Tanana	PEFA	nd	nd	nd	pr(inc)	single adult	63° 29.63"	143° 47.3"
TANANA	211	Tanana	PEFA	nd	nd	nd	pr	pr	63° 32.89"	143° 46.43"
TANANA	221.5	Tanana	PEFA	nd	nd	nd	pr(inc)	4yg	63° 36.58"	143° 49.5"
TANANA	243	Tanana	PEFA	nd	nd	nd	pr(inc)	unoccupied	63° 43.22"	144° 6.26"
TANANA	244.5	Tanana	PEFA	nd	nd	nd	unoccupied	single	63° 43.17"	144° 07.53"
TANANA	247	Tanana	PEFA	nd	nd	nd	nc	1yg	63° 43.19"	144° 11.41"
TANANA	258.5	Tanana	PEFA	nd	nd	nd	unoccupied	2yg	63° 42.83"	144° 22.7"
TANANA	269.5	Tanana	PEFA	nd	nd	nd	pr(inc)	4yg	63° 42.97"	144° 33.72"
TANANA	280.5	Tanana	PEFA	nd	nd	nd	pr(inc)	3yg	63° 46.60"	144° 41.44"
TANANA	282	Tanana	PEFA	nd	nd	nd	nc	unoccupied	63° 47.53"	144° 44.2"
TANANA	288.5	Tanana	PEFA	nd	nd	nd	pr(inc)	2yg	63° 49.37"	144° 48.29"
TANANA	299	Tanana	PEFA	nd	nd	nd	pr	3yg	63° 53.8"	144° 49.14"
TANANA	320	Tanana	PEFA	nd	nd	nd	pr(inc)	3yg	64° 1.33"	144° 54.68"
TANANA	335	Tanana	PII/A	nd	nd	nd	single adult	unoccupied	64° 4.35"	145° 7.97"
TANANA	336.5	Tanana	PEFA	nd	nd	nd	pr	single adult	64° 3.67"	145° 8.8"
TANANA	371	Tanana	PEFA	nd	nd	nd	pr	2yg	64° 9.98"	145° 38.14"
TANANA	376	Tanana	PEFA	nd	nd	nd	pr	3yg	64° 11.47"	145° 40.58"
TANANA	380	Tanana	PEFA	nd	nd	nd	pr(inc)	3 yg	64° 11.02"	145° 45.36"
TANANA	386	Tanana	PEFA	nd	nd	nd	pr?	unoccupied	64° 9.43"	145° 51.55"
TANANA	405	Tanana	PEFA	nd	nd	nd	nc	unoccupied	64° 15.72"	146° 6.44"
TANANA	408	Tanana	PEFA	nd	nd	nd	pr	2yg	64° 14.86"	146° 11.75"
TANANA	414.5	Tanana	PEFA	nd	nd	nd	unoccupied	4yg	64° 15.53"	146° 17.04"
TANANA	427	Tanana	PEFA	nd	nd	nd	pr(inc)	3yg	64° 16.89"	146° 31.52"
TANANA	431	Tanana	PEFA	nd	nd	nd	pr(inc)	pr	64° 16.14"	146° 35.68"
TANANA	436.5	Tanana	PEFA	nd	nd	nd	pr(inc)	1yg	64° 16.59"	146° 40.8"
TANANA	438.5	Tanana	PEFA	nd	nd	nd	pr(inc)	2yg	64° 17.55"	146° 42.08"
TANANA	443	Tanana	PEFA	nd	nd	nd	pr(inc)	unoccupied	64° 19.07"	146° 46.16"
TANANA	459.5	Tanana	PII/A	nd	nd	nd	nc	single adult	64° 24.16"	146° 58"

Appendix 1 (Continued)

Location	NEST	Drainage	Species	STAT 94 ²	STAT95-1	STAT95-2	STAT 96-1	STAT 96-2	Latitude	Longitude
YUKON 1	1001	Salcha	PtJA	single adult	pr (inc)	ad+broken eggs	pr(inc)	4yg	64° 46"	145° 19.39"
YUKON 1	1002	Salcha	PEFA	inact (pr93)	unoccupied	nc	unoccupied	unoccupied	64° 57"	145° 10.35"
YUKON 1	1003	Salcha	PEFA	inact (pr93)	unoccupied	unoccupied	single(inc)	broken eggs	64° 51.54"	144° 31.01"
YUKON 1	1004	Salcha	PEFA	pair	pr (inc)	2 young	pr(inc)	4yg	64° 39.49"	144° 59.17"
YUKON 1	1005	Salcha	PEFA	1 young	unoccupied	single adult	pr(inc)	lyg	64° 40.3"	144° 42"
YUKON 1	1006	Goodpaster	PEFA	3 young	unoccupied	unoccupied	single adult	pr	64° 20.27"	145° 5.56"
YUKON 1	1007	Goodpaster	PEFA	3 young	pr (inc)	4 young	pr(inc)	4yg	64° 18.52"	145° 6.67"
YUKON 1	1008	Salcha	PEFA	unoccupied	pr (inc?)	pair displaying	single adult	single adult	64° 53.59"	144° 25.7"
YUKON 1	1009	Salcha	PEFA	unoccupied	single adult	single adult	unoccupied	pr	64° 42.06"	144° 52.28"
YUKON 1	1010	Salcha	PEFA	unoccupied	single adult	unoccupied	unoccupied	unoccupied	64° 32.22"	145° 24.58"
YUKON 1	1021	Salcha	PEFA	unoccupied	pr (inc)	empty scrape	unoccupied	unoccupied	64° 50.78"	144° 32.55"
YUKON 1	1040	Healy	PEFA	unoccupied	nc	nc	single	unoccupied	64° 0.91"	144° 18.07"
YUKON 1	1041	Healy	PEFA	unoccupied	nc	nc	pr(inc)	2yg	64° 6.9"	143° 58.05"
YUKON 1	1043	Goodpaster	PEFA	unoccupied	unoccupied	unoccupied	single(inc)	3yg	64° 30.25"	144° 31"
YUKON 1	1049	Goodpaster	PtJA	nc	nc	nc	unoccupied	3yg	64° 23.2"	144° 54.94"
YUKON 2	2001	Birch Ck	PEFA	1 young	pr (inc)	4 young	pr	4yg	65° 49.21"	144° 17.51"
YUKON 2	2002	Birch Ck	PEFA	3 young	inc female	3 young	pr(inc)	4yg	65° 45.24"	144° 21.42"
YUKON 2	2003	Birch Ck	PEFA	single adult	inc female	3 young	pr	unoccupied	65° 21.76"	144° 17.08"
YUKON 2	2004	Birch Ck	PEFA	1 young	pr (inc)	3 young	pr(inc)	2yg	65° 19.24"	144° 24.71"
YUKON 2	2005	Birch Ck	PEFA	pair	pr (inc)	2 young	pr(inc)	unoccupied	65° 20.56"	144° 50.47"
YUKON 2	2006	Birch Ck	PEFA	single adult	unoccupied	unoccupied	single+egg	unoccupied	65° 18.44"	144° 27.91"
YUKON 2	2007	Birch Ck	PEFA	single adult	pr (inc)	ad+eggs	pr(inc)	single+eggs	65° 19.76"	144° 31.9"
YUKON 2	2008	Birch Ck	PEFA	inact (pr 93)	unoccupied	single adult	unoccupied	single adult	65° 13.38"	144° 16.44"
YUKON 2	2009	Birch Ck	PEFA	inact (pr 93)	unoccupied	single adult	pr(inc)	lyg	65° 15.35"	144° 21.5"
YUKON 2	2010	Black R	PEFA	2 young	nc	nc	nc	2 yg	65° 41.4"	143° 3.04"
YUKON 2	2016	Birch Ck	PEFA	unoccupied	pr (inc)	2 young	pr(inc)	dead yg	65° 18.22"	145° 1.7"
YUKON 2	2023	Birch Ck	PEFA	nc	nc	nc	pr(inc)	3yg	65° 43.05"	144° 42.81"
YUKON 2	2024	Birch Ck	PEFA	nc	nc	nc	pr(inc)	3yg	65° 42.93"	144° 47.37"
YUKON 2	2025	Birch Ck	PtJA	nc	nc	nc	single(inc)	3yg	65° 48.09"	144° 48.42"
YUKON 2	2026	Birch Ck	PEFA	nc	nc	nc	pr	unoccupied	65° 46.59"	145° 24.4"
YUKON 2	2027	Birch Ck	PEFA	nc	nc	nc	single	single	65° 41.81"	145° 7.24"
YUKON 2	2028	Birch Ck	PEFA	nc	nc	nc	pr(inc)	2yg	65° 41.53"	145° 3.39"
YUKON 2	2029	Birch Ck	PEFA	nc	unoccupied	unoccupied	pr	2yg	65° 8.72"	145° 29.1"

Appendix 1 (Continued)

Location	NEST	Drainage	Species	STAT 94 ²	STAT95-1	STAT95-2	STAT 96-1	STAT 96-2	Latitude	Longitude
YUKON 2	2030	Birch Ck	PEFA	unoccupied	unoccupied	unoccupied	pr	unoccupied	65° 21.51"	144° 41.7"
YUKON 2	2032	SF Birch Ck	PEFA	unoccupied	unoccupied	unoccupied	pr(inc)	2yg	65° 17.72"	144° 25.28"
YUKON 2	2033	SF Birch Ck	PEFA	unoccupied	unoccupied	unoccupied	single	unoccupied	65° 12.27"	144° 5.02"
YUKON 2	2034	SF Birch Ck	PEFA	unoccupied	unoccupied	unoccupied	single	unoccupied	65° 8.26"	143° 47.78"
YUKON 2	2038	Black	PEFA	nc	nc	nc	nc	3yg	65° 36.35"	143° 7.66"
YUKON 3	3001	Seventy Mile	PEFA	single	unoccupied	unoccupied	unoccupied	nc	64° 54"	141° 18.5"
YUKON 3	3002	Seventy Mile	PEFA	2 young	pair (inc?)	single adult	unoccupied	1+yg	64° 54.18"	141° 36.89"
YUKON 3	3003	Seventy Mile	PEFA	1 young	single adult	3 young	unoccupied	single adult	64° 55.82"	141° 44.04"
YUKON 3	3004	Seventy Mile	PEFA	1 young	pr (inc)	3 young	single(inc)	4yg	64° 59.17"	142° 12.05"
YUKON 3	3005	Seventy Mile	PEFA	pair	single adult	unoccupied	pr(inc)	2yg	64° 59.78"	142° 19.04"
YUKON 3	3006	Seventy Mile	PEFA	pair	unoccupied	3 young	unoccupied	3yg	64° 53.48"	142° 16.81"
YUKON 3	3007	Forty Mile	PEFA	pair	pr (inc)	ad + egg	single adult	2yg	64° 26.07"	143° 14.53"
YUKON 3	3008	Forty Mile	PEFA	3 young	single adult	unoccupied	unoccupied	unoccupied	64° 36.95"	142° 12.05"
YUKON 3	3009	Forty Mile	PEFA	pair	pr (inc)	2 young	pr(inc)	2yg(egg)	64° 4.26"	142° 1"
YUKON 3	3010	Seventy Mile	PEFA	1 young	pr (inc)	3 young	single adult	2yg	64° 42.43"	141° 32.41"
YUKON 3	3022	Seventy Mile	PEFA	unoccupied	pr (inc)	3 young	single (inc)	2yg	64° 55.9"	141° 49.61"
YUKON 3	3023	Seventy Mile	PEFA	unoccupied	pr (brown ad)	unoccupied	unoccupied	unoccupied	64° 58.74"	141° 59.41"
YUKON 3	3024	Seventy Mile	PEFA	nc	pair	single adult	single (inc)	2yg	64° 50.9"	141° 50.36"
YUKON 3	3025	Seventy Mile	PEFA	nc	pr (inc)	2 young	pr(inc)	2yg	64° 53.2"	141° 33.41"
YUKON 3	3027	Forty Mile	PEFA	nc	single	nc	pr(inc)	2yg	64° 28.19"	142° 15.41"
YUKON 3	3028	Forty Mile	PEFA	nc	pr (brown ad)	nc	unoccupied	unoccupied	64° 28.14"	142° 31.61"
YUKON 3	3029	Forty Mile	PEFA	nc	pair	nc	unoccupied	unoccupied	64° 27.55"	142° 38.19"
YUKON 3	3030	Forty Mile	PEFA	nc	pr (inc)	2 young	pr(inc)	2yg	64° 27.43"	142° 40.07"
YUKON 3	3031	Forty Mile	PEFA	nc	pair	nc	unoccupied	unoccupied	64° 24.11"	142° 48.95"
YUKON 3	3032	Forty Mile	PEFA	nc	pair (inc)	nc	pr(inc)	1yg	64° 23.17"	142° 53.17"
YUKON 3	3033	Seventy Mile	PEFA	unoccupied	unoccupied	adult + dead yg	unoccupied	unoccupied	64° 58.2"	142° 4.76"
YUKON 3	3045	Seventy Mile	PEFA	unoccupied	unoccupied	unoccupied	pr(inc)	2yg	64° 57.41"	141° 58.59"
YUKON 3	3046	Seventy Mile	PEFA	unoccupied	unoccupied	unoccupied	single	unoccupied	64° 47.41"	141° 28.87"
YUKON 3	3049	Forty Mile	PEFA	unoccupied	unoccupied	unoccupied	pr(inc)	unoccupied	64° 28.2"	142° 12.25"
YUKON 3	3050	Forty Mile	PEFA	nc	unoccupied	unoccupied	pr(inc)	2yg	64° 33.22"	142° 2.2"
YUKON 3	3051	Forty Mile	PEFA	unoccupied	unoccupied	unoccupied	single	unoccupied	64° 35.34"	142° 9.89"
YUKON 3	3052	Forty Mile	PEFA	unoccupied	unoccupied	unoccupied	pr(inc)	2yg	64° 37.26"	142° 15.44"
YUKON 3	3054	Forty Mile	PEFA	unoccupied	unoccupied	unoccupied	pr(inc)	3yg	64° 28.54"	142° 19.65"

Appendix 1 (Continued)

Location	NEST	Drainage	Species	STAT 94 ²	STAT95-1	STAT95-2	STAT 96-1	STAT 96-2	Latitude	Longitude
YUKON 3	3058	Forty Mile	PEFA	nc	nc	nc	nc	2yg	64° 40.64"	142° 4.69"
YUKON 3	3059	Forty Mile	PEFA	unoccupied	unoccupied	unoccupied	nc	2yg	64° 28.58"	142° 28.84"
YUKON 3	3060	Seventy Mile	PEFA	unoccupied	unoccupied	unoccupied	unoccupied	2yg	64° 58.17"	142° 8.05"
YUKON 4	4001	Nation	PEFA	nc	single adult	nc	nc	nc	65° 30.8"	141° 1.55"
YUKON 4	4002	Nation	PEFA	nc	pr (inc)	2 young	nc	nc	65° 25.21"	141° 23.13"
YUKON 4	4003	Kandik	PEFA	nc	single adult	nc	nc	nc	65° 31.36"	141° 42.6"
YUKON 4	4004	Kandik	PEFA	nc	pr (inc)	3 young	nc	nc	65° 33.37"	141° 33.21"
YUKON 4	4005	Nation	PEFA	unoccupied	single adult	nc	nc	nc	65° 35.08"	141° 30.45"
YUKON 4	4006	Black	PEFA	2 young	nc	nc	nc	4yg	66° 11.27"	142° 11.17"
YUKON 4	4010	Black	PEFA	nc	nc	nc	nc	2yg	66° 10.31"	141° 23.77"
YUKON 4	4011	Black	PEFA	unoccupied	nc	nc	nc	lyg	65° 42.43"	142° 2.33"
YUKON 5	5001	Black	PEFA	1 young	nc	nc	nc	nc	66° 40.63"	142° 10.24"
YUKON 5	5002	Black	PEFA	single adult	nc	nc	nc	nc	66° 29.75"	142° 24.2"
YUKON 5	5003	Black	PEFA	3 young	nc	nc	nc	nc	66° 36.32"	142° 49.64"
YUKON 5	5004	Black	PEFA	2 young	nc	nc	nc	nc	66° 42.35"	143° 5.07"
YUKON 5	5005	Black	PEFA	3 young	nc	nc	nc	nc	66° 41.06"	143° 30.33"
YUKON 5	5042	Black	PEFA	unoccupied	nc	nc	nc	lyg	66° 28.33"	141° 24.52"

¹ Status: STAT 94 = July survey only.

STAT 95-1 and 95-2 = aerial survey in May and July, respectively.

STAT 96-1 and 96-2 = aerial survey in May and July, respectively.

² nd = historical survey data not entered.

nc = not checked.

Appendix 2. Bald Eagle nest site location and status, Tanana River and Yukon MOAs 1–5, Alaska, 1994–1996¹.

Location	Nest	Species	Drainage	STAT94 ²	STAT95	STAT96	Latitude	Longitude
TANANA	2.1	BAEA	Tanana	nc	nc	active,lyg	63° 25.45"	142° 57.20"
TANANA	3.1	BAEA	Tanana	nc	nc	active,2yg	63° 24.40"	143° 10.10"
TANANA	4.1	BAEA	Tanana	nc	nc	active,2yg	63° 23.00"	143° 22.75"
TANANA	6.1	BAEA	Tanana	nc	nc	occupied	63° 04.40"	143° 46.52"
TANANA	7.3	BAEA	Tanana	inactive	nc	inactive	63° 36.33"	143° 51.69"
TANANA	7.4	BAEA	Tanana	active	nc	inactive	63° 35.75"	143° 51.88"
TANANA	7.5	BAEA	Tanana	active	nc	active,2yg	63° 32.78"	143° 47.24"
TANANA	8.1	BAEA	Tanana	active	nc	active,lyg	63° 42.73"	144° 02.56"
TANANA	8.2	BAEA	Tanana	inactive	nc	inactive	63° 40.04"	143° 57.59"
TANANA	7.1	BAEA	Tanana	nc	nc	active,lyg	63° 43.35"	143° 53.75"
TANANA	9.2	BAEA	Tanana	active	nc	nl	63° 43.27"	144° 15.44"
TANANA	10.3	BAEA	George	inactive	nc	inactive	63° 48.37"	144° 27.15"
TANANA	10.4	BAEA	George	active	nc	occupied	63° 48.51"	144° 28.44"
TANANA	12.1	BAEA	Tanana	inactive	nc	inactive	63° 57.80"	144° 54.30"
TANANA	12.2	BAEA	Healy	active	nc	nl	63° 57.37"	144° 39.83"
TANANA	12.3	BAEA	Healy	active	nc	nl	63° 58.81"	145° 43.80"
TANANA	13.1	BAEA	Tanana	active	nc	active,2yg	64° 01.84"	144° 58.38"
TANANA	13.2	BAEA	Tanana	active	nc	active,failed	64° 00.85"	144° 54.01"
TANANA	13.3	BAEA	Tanana	inactive	nc	inactive	64° 00.69"	144° 53.55"
TANANA	14.1	BAEA	Tanana	inactive	nc	active,2yg	64° 03.97"	145° 14.71"
TANANA	14.2	BAEA	Tanana	active	nc	inactive	64° 03.91"	145° 07.64"
TANANA	14.4	BAEA	Tanana	active	nc	active,failed	64° 03.91"	145° 02.69"
TANANA	14.5	BAEA	Tanana	inactive	nc	inactive	64° 02.85"	145° 00.04"
TANANA	14.6	BAEA	Tanana	nc	nc	inactive	64° 04.00"	145° 01.25"
TANANA	15.1	BAEA	Tanana	inactive	nc	inactive ³	64° 05.74"	145° 29.05"
TANANA	15.3	BAEA	Tanana	active	nc	active,2yg	64° 04.77"	145° 23.50"
TANANA	15.4	BAEA	Tanana	inactive	nc	inactive	64° 04.88"	145° 18.65"
TANANA	16.2	BAEA	Tanana	active	nc	active,2yg	64° 07.11"	145° 36.24"
TANANA	16.5	BAEA	Tanana	inactive	nc	inactive	64° 04.99"	145° 34.46"
TANANA	16.6	BAEA	Tanana	occupied	nc	inactive	64° 11.00"	145° 41.00"
TANANA	16.7	BAEA	Tanana	active	nc	occupied	64° 08.80"	145° 38.40"
TANANA	17.2	BAEA	Tanana	inactive	nc	active,2yg	64° 10.86"	145° 54.91"

Appendix 2 (Continued)

Location	Nest	Species	Drainage	STAT94 ²	STAT95	STAT96	Latitude	Longitude
TANANA	17.3	BAEA	Tanana	active	nc	active,2yg	64° 12.80"	145° 59.90"
TANANA	18.1	BAEA	Tanana	active	nc	inactive	64° 13.71"	146° 04.18"
TANANA	18.2	BAEA	Tanana	inactive	nc	inactive ³	64° 14.72"	146° 06.38"
TANANA	18.3	BAEA	Tanana	active	nc	active,2yg	64° 14.59"	146° 11.66"
TANANA	19.3	BAEA	Tanana	active	nc	active,failed	64° 15.67"	146° 21.21"
TANANA	20.1	BAEA	Tanana	inactive	nc	inactive	64° 15.08"	146° 38.76"
TANANA	20.2	BAEA	Tanana	active	nc	active,lyg	64° 15.70"	146° 40.98"
TANANA	21.2	BAEA	Tanana	active	nc	active,failed	64° 19.69"	146° 50.13"
TANANA	22.3	BAEA	Tanana	nc	nc	inactive	64° 25.25"	146° 59.75"
TANANA	22.4	BAEA	Tanana	active	nc	active,lyg	64° 28.79"	146° 59.31"
TANANA	22.5	BAEA	Tanana	nc	nc	inactive	64° 28.85"	146° 59.25"
TANANA	24.7	BAEA	Tanana	active	nc	active,lyg	64° 39.46"	147° 13.89"
TANANA	24.8	BAEA	Tanana	inactive	nc	active,unkn	64° 37.20"	147° 10.52"
TANANA	25.1	BAEA	Tanana	inactive	nc	inactive	64° 42.44"	147° 19.69"
TANANA	25.2	BAEA	Tanana	active	nc	active,2yg	64° 42.38"	147° 20.34"
TANANA	25.3	BAEA	Tanana	inactive	nc	inactive	64° 43.09"	147° 22.83"
TANANA	26.1	BAEA	Tanana	inactive	nc	nl	64° 46.17"	147° 36.70"
TANANA	26.2	BAEA	Tanana	inactive	nc	active,lyg	64° 46.61"	147° 36.28"
TANANA	27.2	BAEA	Tanana	active	nc	active,2yg	64° 47.46"	147° 51.32"
TANANA	28.1	BAEA	Tanana	active	nc	active,unkn	64° 42.73"	148° 10.91"
TANANA	29.2	BAEA	Tanana	nc	nc	active,unkn	64° 39.46"	148° 24.96"
YUKON I	1011	BAEA	Salcha	active,failed	nc	active,2yg	64° 38.08"	145° 54.31"
YUKON I	1012	BAEA	Salcha	active,lyg	nc	active,failed	64° 39.01"	145° 46.94"
YUKON I	1013	BAEA	Salcha	active,failed	nc	active,lyg	64° 38.74"	145° 24.24"
YUKON I	1014	BAEA	Salcha	active,lyg	active	inactive	64° 40.15"	144° 55.14"
YUKON I	1015	BAEA	Salcha	active,lyg	active	inactive	64° 35.08"	146° 08.86"
YUKON I	1016	BAEA	Salcha	active,failed	nc	active,failed	64° 29.87"	146° 30.34"
YUKON I	1017	BAEA	Salcha	active,failed	nc	active,failed	64° 46.09"	145° 18.09"
YUKON I	1018	BAEA	Salcha	inactive	inactive	active,2yg	64° 39.19"	145° 47.15"
YUKON I	1019	BAEA	Salcha	inactive	nc	inactive	64° 49.01"	144° 31.19"
YUKON I	1038	BAEA	Goodpaster	inactive	inactive	inactive	64° 15.80"	145° 09.14"
YUKON I	1048	BAEA	Salcha	nc	nc	nc	64° 50.08"	144° 29.67"
YUKON I	1049	BAEA	Salcha	nc	nc	active,lyg	na	na
YUKON I	1050	BAEA	Salcha	nc	nc	active,unkn	64° 31.96"	146° 17.71"

Appendix 2 (Continued)

Location	Nest	Species	Drainage	STAT94 ²	STAT95	STAT96	Latitude	Longitude
YUKON 2	2010	BAEA	Birch Ck	active,failed	active	active,2yg	65° 35.41"	144° 25.84"
YUKON 2	2011	BAEA	Birch Ck	active,unkn	nc	nc	66° 05.11"	144° 43.03"
YUKON 2	2012	BAEA	Birch Ck	active,failed	occupied	active,failed	65° 46.33"	144° 17.75"
YUKON 2	2013	BAEA	Birch Ck	active,failed	inactive	active,2yg	65° 16.42"	145° 27.17"
YUKON 2	2014	BAEA	Birch Ck	inactive	nc	nc	65° 19.35"	145° 54.34"
YUKON 2	2037	BAEA	Birch Ck	nc	nc	active,lyg	65° 43.88"	144° 21.49"
YUKON 3	3034	BAEA	Forty Mile	inactive	nc	inactive	64° 26.67"	142° 42.88"
YUKON 3	3035	BAEA	Forty Mile	active,failed	active	active,2yg	64° 32.61"	142° 08.69"
YUKON 3	3036	BAEA	Forty Mile	inactive	nc	nc	63° 38.65"	141° 55.53"
YUKON 3	3037	BAEA	Forty Mile	active,failed	nc	nc	63° 51.23"	142° 51.32"
YUKON 3	3038	BAEA	Forty Mile	inactive	nc	nc	63° 51.63"	142° 51.15"
YUKON 3	3039	BAEA	Forty Mile	inactive	nc	nc	63° 55.44"	142° 50.46"
YUKON 3	3040	BAEA	Seventy Mi	inactive	inactive	inactive	64° 54.23"	141° 32.75"
YUKON 3	3041	BAEA	Forty Mile	inactive	nc	nc	64° 10.85"	141° 45.28"
YUKON 3	3042	BAEA	Forty Mile	inactive	nc	inactive	64° 26.54"	142° 41.59"
YUKON 3	3043	BAEA	Forty Mile	inactive	nc	nc	64° 20.11"	143° 15.23"
YUKON 3	3044	BAEA	Forty Mile	active,lyg	nc	nc	64° 12.94"	143° 23.56"
YUKON 4	4007	BAEA	Nation	nc	active	nc	65° 30.50"	141° 13.00"
YUKON 5	5006	BAEA	Black	active,failed	nc	inactive	66° 11.81"	142° 07.64"
YUKON 5	5007	BAEA	Black	active,failed	nc	inactive	66° 26.27"	141° 30.05"
YUKON 5	5008	BAEA	Black	inactive	nc	inactive	66° 26.53"	141° 30.99"
YUKON 5	5009	BAEA	Black	inactive	nc	inactive	66° 27.61"	141° 40.14"
YUKON 5	5010	BAEA	Black	inactive	nc	inactive	66° 29.05"	141° 40.48"
YUKON 5	5011	BAEA	Black	inactive	nc	active,failed	66° 28.82"	141° 42.98"
YUKON 5	5012	BAEA	Black	inactive	nc	inactive	66° 26.94"	141° 29.94"
YUKON 5	5013	BAEA	Black	inactive	nc	active,lyg	66° 27.33"	141° 29.22"
YUKON 5	5014	BAEA	Black	inactive	nc	inactive	66° 16.06"	141° 55.17"
YUKON 5	5015	BAEA	Black	active,failed	nc	active,unkn	66° 30.18"	141° 48.71"
YUKON 5	5016	BAEA	Black	active,failed	nc	active,unkn	66° 31.03"	141° 58.03"
YUKON 5	5017	BAEA	Black	inactive	nc	inactive	66° 31.11"	142° 03.92"
YUKON 5	5018	BAEA	Black	active,failed	nc	inactive	66° 31.26"	142° 11.59"
YUKON 5	5019	BAEA	Black	inactive	nc	active,failed	66° 31.31"	142° 12.05"
YUKON 5	5020	BAEA	Black	active,failed	nc	active,failed	66° 31.34"	142° 14.47"
YUKON 5	5021	BAEA	Black	active,failed	nc	inactive	66° 30.23"	142° 20.12"

Appendix 2 (Continued)

Location	Nest	Species	Drainage	STAT94 ²	STAT95	STAT96	Latitude	Longitude
YUKON 5	5022	BAEA	Black	active, failed	nc	active, failed	66° 15.73"	142° 00.20"
YUKON 5	5023	BAEA	Black	inactive	nc	inactive	66° 16.52"	142° 00.01"
YUKON 5	5024	BAEA	Black	active, failed	nc	inactive	66° 31.24"	142° 32.39"
YUKON 5	5025	BAEA	Black	inactive	nc	inactive	66° 30.74"	142° 31.00"
YUKON 5	5026	BAEA	Black	active, failed	nc	active, lyg	66° 32.83"	142° 34.42"
YUKON 5	5027	BAEA	Black	active, failed	nc	inactive	66° 35.04"	142° 41.51"
YUKON 5	5028	BAEA	Black	inactive	nc	inactive	66° 35.19"	142° 41.30"
YUKON 5	5029	BAEA	Black	active, failed	nc	inactive	66° 38.11"	142° 54.42"
YUKON 5	5030	BAEA	Black	inactive	nc	inactive	66° 38.53"	142° 54.72"
YUKON 5	5031	BAEA	Black	inactive	nc	inactive	66° 38.67"	142° 51.78"
YUKON 5	5032	BAEA	Black	inactive	nc	inactive	66° 38.53"	143° 02.43"
YUKON 5	5033	BAEA	Black	inactive	nc	inactive	66° 38.10"	143° 03.27"
YUKON 5	5034	BAEA	Black	inactive	nc	inactive	66° 39.11"	143° 18.89"
YUKON 5	5035	BAEA	Black	inactive	nc	inactive	66° 39.46"	143° 19.54"
YUKON 5	5036	BAEA	Black	active, failed	nc	active, unkn	66° 40.97"	143° 26.62"
YUKON 5	5037	BAEA	Black	active, failed	nc	active, lyg	66° 10.71"	141° 40.78"
YUKON 5	5038	BAEA	Black	inactive	nc	active, failed	66° 12.22"	142° 08.69"
YUKON 5	5040	BAEA	Black	inactive	nc	inactive	66° 08.49"	143° 00.59"
YUKON 5	5043	BAEA	Black	nc	nc	inactive	66° 13.31"	141° 47.97"
YUKON 5	5041	BAEA	Black	nc	nc	active, unkn	66° 27.33"	141° 29.22"
YUKON 5	5044	BAEA	Black	nc	nc	active, failed	66° 34.63"	142° 36.90"
YUKON 5	5045	BAEA	Black	nc	nc	inactive	66° 31.37"	142° 10.68"
YUKON 5	5046	BAEA	Black	nc	nc	active, unkn	66° 29.56"	142° 28.64"
YUKON 5	5047	BAEA	Black	nc	nc	inactive	66° 39.08"	143° 16.50"

¹ Status: STAT 94 = aerial survey in May.

STAT 95 = aerial survey in May.

STAT 96 = aerial and boat surveys in May and July.

² nc = not checked.

nl = not located.

³ Inactive - nest collapsing.

DRAFT ANNUAL REPORT

**PEREGRINE FALCON (*FALCO PEREGRINUS ANATUM*) SURVEYS AND
NOISE MONITORING IN YUKON MOAs 1-4 AND ALONG THE
TANANA RIVER, ALASKA, 1995**

Prepared for

**Alaska Cooperative Fish and Wildlife Research Unit
University of Alaska Fairbanks
(Purchase Order FS 163850)**

Prepared by

Robert J. Ritchie
Stephen M. Murphy
and
Michael D. Smith

ABR, Inc.
P.O. Box 80410
Fairbanks, AK 99708

May 1996