Alaska Department of Fish and Game
Division of Wildlife Conservation
March 1999

Documentation of Active Peregrine Falcon Nest Sites

1 Oct 1994–31 March 1998

John M. Wright
Peter J. Bente

Final Research Performance Report
Endangered Species Conservation Fund
Federal Aid Studies SE-2-**9, 10, and 11**

RESEARCH FINAL REPORT

STATE: **Alaska**

COOPERATOR: **USDI Fish and Wildlife Service**

GRANT: **SE-2-9, 10 & 11**

STUDY TITLE: **Documentation of Active Peregrine Falcon Nest Sites**

AUTHOR: **John M. Wright and Peter J. Bente**

PERIOD: **1 October 1994–31 March 1998**

SUMMARY

We monitored the abundance and productivity of peregrine falcons (*Falco peregrinus*) along the Sagavanirktok River in northern Alaska from 1995 through 1998 and along the Tanana River in Interior Alaska in 1995 and 1996. Population monitoring began on these rivers in 1979, and they were subsequently established as representative study areas in the Peregrine Falcon Recovery Plan – Alaska Population (US Fish and Wildlife Service 1982). Peregrine populations in these study areas increased throughout the 1980s and 1990s, reaching numbers higher than the goals set in the Recovery Plan. In 1994, the arctic peregrine falcon (*F. p. tundrius*) was delisted by the US Fish and Wildlife Service (Swem 1994). The American peregrine falcon (*F. p. anatum*) that nests along the Tanana River was proposed for delisting in 1998 (Mesta 1998).

On the Sagavanirktok River, the number of pairs of peregrines increased from 18 in 1995 to 27 in 1998. The number of young produced per pair ranged between 1.33 and 2.48 in the same period, with a high of 62 young produced in 1997. A falconry harvest of nestling arctic peregrines for falconry was initiated in 1996. Three nestlings were taken in 1996 from the Sagavanirktok, 2 in 1997, and 2 in 1998.

On the Tanana River, we observed 34 pairs in 1995 and in a single visit to the study area in 1996 found 27 pairs. Productivity was studied only in 1995, when 26 successful pairs with 71 young were observed.

Key Words: *Falco peregrinus*, monitoring, nesting, peregrine falcon, productivity, Sagavanirktok River, Tanana River.

CONTENTS

BACKGROUND

The peregrine falcon (*Falco peregrinus*) is a well-known endangered species that suffered drastic declines and extirpations in Europe and North America during the 1960s as a result of pesticide contamination (Hickey 1969, Cade et al. 1988). Populations of 2 of the 3 subtaxa in Alaska (White 1968) declined significantly and were listed as endangered in 1973. The American peregrine falcon (*F. p. anatum*) nests in boreal and temperate forest regions and is classified as endangered by the federal government but was proposed for delisting by the US Fish and Wildlife Service in 1998 (Mesta 1998). The arctic peregrine falcon (*F. p. tundrius*) breeds in tundra regions. It was reclassified from endangered to threatened status by federal authorities in 1984 and delisted effective 4 October 1994 (Swem 1994). Both the American and arctic peregrine falcons were removed from the Alaska State Endangered Species List in 1993 and placed on the Alaska Department of Fish and Game (ADF&G) list of Species of Special Concern. Peale's peregrine falcon (*F. p. pealei*), the third subtaxon in Alaska, lives in coastal regions of the state from the Aleutians south through the Gulf of Alaska and southeastern Alaska and has never been classified as threatened or endangered. Unlike the first 2 subtaxa that are long-distance migrants, wintering as far south as Argentina, Peale's peregrines are year-round residents of Alaska or short-distance migrants along the west coast of North America.

As part of a national program to restore peregrine falcon populations, the US Fish and Wildlife Service (FWS) established the Alaska Peregrine Falcon Recovery Team to develop a recovery plan for American and arctic peregrine falcons (US Fish and Wildlife Service 1982). The plan recognized the importance of monitoring population trends, identifying nesting habitats and prey species, and protecting nesting areas from incompatible human activities. The recovery plan established 4 representative study areas (2 areas for each subtaxon) to monitor the status and recovery of the peregrine falcon in Alaska. The representative areas for the delisted arctic peregrine falcon are the Colville and Sagavanirktok rivers. The representative areas for the endangered American peregrine falcon are the Tanana and upper Yukon rivers. The FWS and the Bureau of Land Management (BLM) assumed responsibility for surveying all areas from 1979 to 1990. With funding provided by FWS, since 1991 the Alaska Department of Fish and Game (ADF&G) has assisted in monitoring the populations on the Sagavanirktok and Tanana rivers.

Roseneau et al. (1981) summarizes the early history of numbers and occupancy of peregrine falcons on the Sagavanirktok and Tanana rivers. Intermittent surveys from the late 1960s through the 1970s show the number of peregrines declined to 1 pair on the Sagavanirktok River in 1976 and just 2 lone adults and no pairs on the Tanana River in 1976. Annual monitoring of each study area began in 1979. As the populations recovered, the number of active territories and the area occupied along each river increased. Survey coverage was broadened over the years to include the growing population.

For the Sagavanirktok River, survey coverage has changed considerably over the years. Before 1991, Franklin Bluffs, Sagwon Bluffs, and a few isolated sites (e.g., Ice Cut, Happy Valley) were the only areas regularly surveyed along the river. The other portions of the river were not studied because they were not thought to contain suitable nesting habitat. During the late 1980s observations of nesting peregrines along many rivers of the central North Slope (Robert Ritchie, pers. commun.) suggested that peregrines might be nesting along the unsurveyed areas of the Sagavanirktok River. Beginning in 1991 a concerted effort was made to survey the entire river below 2000 ft elevation. Survey coverage increased from approximately 40 km along the river to 160 km. The increase in occupied sites observed in 1991 was largely the result of increased survey effort, yet during the same time population recovery was also contributing to the increased number of occupied sites.

For the Tanana River survey, coverage is much more comparable throughout the years. In 1985 the survey area was extended 50 km upstream of Tanacross to include a newly found pair at the Tok River. In 1992 we extended the survey area downstream from Fairbanks to Nenana (100 km) to include 2 historic nest sites that were not part of earlier surveys and upstream an additional 15 km to start at the Tetlin Bridge, approximately 16 km east of Tok.

OBJECTIVES

The field study objectives for peregrine falcons in 1995 to 1998 were the following:

1 Locate nesting territories
2 Determine productivity

STUDY AREA AND METHODS

The study areas were along the Sagavanirktok River in northern Alaska and the Tanana River in central Alaska (Fig. 1). In 1995, 2 surveys were conducted on both rivers, but in subsequent years only 1 late season survey (in late July-early August during the nestling period) was conducted on the Sagavanirktok, and the Tanana was only surveyed in 1996 with a single survey early in the season during the incubation period (Table 1). ADF&G staff have not participated in peregrine surveys on the Tanana River since 1996. On the first survey during the early nesting period we determined the number of birds attempting to breed in the area. On the second survey during the mid to late nesting period, we determined the number of pairs successful in rearing young. We visited nest sites during the second survey to band young.

In our surveys, we look for nesting pairs on steep soil banks, gravel exposures, rock cliffs, and similar habitats. Whenever possible we stop on an island, sandbar, or riverbank to obtain a frontal view of the habitat. However, in many circumstances we must make our observations while floating past a nesting area.

We look for perched or flying birds or evidence of nest sites by carefully checking the bluff or cliff with binoculars or spotting scopes. We use a Field Model Questar spotting scope (65x magnification) to view nest ledges from a distance to avoid disturbing the birds. It is common to document occupancy by finding incubating birds with the Questar scope. Since peregrines respond vocally to intruders in their nesting areas, listening for defensive calls or courtship calls is an important survey technique in suitable conditions. Wind, rain, river noise, or other loud noises often obscure faint or distant calls of the birds. Climbing the area is sometimes necessary to help locate birds or their nest sites. If birds are present, our activities are performed quickly to minimize disturbance to nesting pairs. If birds are not located, we remain in the area as long as possible to detect birds as they become conspicuous in their normal activities. The FWS recommends a minimum of 4 hours observation before assuming a site is unoccupied; however, this is sometimes not achieved at potential nest locations because of the large area to be surveyed in a short time. When peregrine falcons are observed, the exact location is plotted on photographs or maps of the area.

During the second survey we climb to nest sites using standard rock climbing techniques. We count and band nestlings. Nestlings are banded with FWS lock-on aluminum leg bands on the right leg and an auxiliary marker color band on the left leg. The color band is an anodized aluminum, riveted leg band that has an engraved alphanumeric code. Two colors are used following the protocol developed by the FWS: arctic peregrine falcons are banded with blue bands and American peregrine falcons are banded with black bands. The engraved code on the color band is large enough to be read with a powerful spotting scope. We use the Questar scope to read the color-band codes on previously banded birds.

Each nesting area or area of potential nesting habitat is photographed with a 35 mm camera to prepare an atlas of nesting sites. The photographs are taken to show a distant view of the general landform, as well as a series of overlapping close-up views to show detail of the exact nest location. Most of the photography is completed in June and additional observations of peregrines are recorded on the photographs during the second survey.

All nesting locations are recorded on 1:63,360- and 1:250,000-scale US Geological Survey maps. Numbers, productivity, nesting status, activities, and nest-site characteristics are recorded on Raptor Observation Record Cards developed for the Alaska Raptor Database used by FWS. The maps, cards, banding data, and samples are filed with FWS Endangered Species Branch, Ecological Services, Fairbanks, Alaska.

SAGAVANIRKTOK RIVER

The Sagavanirktok River is a glacial river that flows northward from the Brooks Range to the Arctic Ocean in the central North Slope of Alaska. The study area includes the main river from the foothills near Slope Mountain in the southern portion of the drainage to the north end of Franklin Bluffs near the river delta at Prudhoe Bay. Peregrine falcon nesting habitat along the river ranges from large cliff exposures to less prominent soil and gravel banks. Sites along the Sagavanirktok River were reached by ADF&G staff using 3 methods, 1) by raft or canoe on the river, 2) on foot from the Dalton Highway, and 3) by fixed-wing aircraft.

TANANA RIVER

The Tanana River is a glacial river flowing westward through the Tanana Uplands of Interior Alaska. The study area includes the Tanana River from the Tetlin Bridge, approximately 16 km east of Tok, to Nenana, excluding the section between the Salcha River and Fairbanks that lacks suitable nesting habitat. Surveys were conducted by ADF&G staff using a 20-ft outboard jet-powered riverboat that allowed boating along the shallow channels common in this braided, glacial river.

RESULTS AND DISCUSSION

SURVEY COVERAGE

In northern Alaska we surveyed 160 km of the Sagavanirktok River. The marginal habitat in the foothills south (upstream) of Slope Mountain Department of Transportation Maintenance Station was not surveyed. The southern area was last surveyed in 1991. In 1998, we surveyed an additional 20 km at the northern end of Franklin Bluffs.

In Interior Alaska we surveyed 418 km of the Tanana River, from the Tetlin Bridge to Salcha and specific sites near Nenana.

PAIRS OF PEREGRINE FALCONS

In the Sagavanirktok River study area, the number of pairs of peregrines increased from 18 to 27 during 1995-1998 (Table 2, Fig. 2). An additional 2 to 6 lone adults were seen each year. Table 3 summarizes the history of occupancy and productivity on the Sagavanirktok River. The number of pairs in 1997 (25) and 1998 (27) exceeded the previous high number (23) counted in 1992 and 1993. The numbers reported for 1996-1998 represent minimal counts because only a single survey was conducted in those years, compared with 2 surveys in prior years.

In the Tanana River study area, 34 pairs were observed in 1995 and 27 were counted in a single early season survey in 1996 (Table 4). An additional 3 lone adults were seen in 1995 and 7 lone adults were observed in 1996. The history of the number of pairs and lone adults on the Tanana is

summarized in Table 5. The number of pairs increased consistently through 1995 (Fig. 3). The 1996 count is not directly comparable because only a single May survey was conducted, rather than 2 surveys (May and July).

PRODUCTIVITY

Sagavanirktok River

In the Sagavanirktok River study area, the number of successful pairs increased from 13 in 1995 to 23 in 1997 and declined to 16 in 1998. The number of young produced also peaked in 1997, at 62, well above the previous high of 39 in 1996. Forty-four young were produced in 1998.

The remarkably high number of young produced in 1997 was due to the large percentage of pairs that were successful rearing young (92%, 23 of 25 pairs) combined with an above average number of young per successful pair (2.70). In 1998, the number of young produced per successful pair was high (2.75), but far fewer pairs were successful (59%, 16 of 27). Since 1991 when the current effort to completely survey the Sagavanirktok River was initiated, an average of 72% of pairs each year have successfully raised young with a mean of 2.43 young per successful pair.

Tanana River

In 1995 in the Tanana River study area, 26 successful pairs produced a minimum of 71 young (Table 4). Eight pairs failed to produce young to banding age. The number of young is a minimum value because we were unable to count the nestlings at one site. Productivity averaged 2.73 young per successful nest and 2.09 young per total pairs (Table 5). A second survey during the nestling period was not conducted in 1996, therefore no information is available for that year.

Table 5 summarizes the history of productivity on the Tanana River. The number of successful pairs increased from 19 in 1993 to 24 in 1994 and 26 in 1995. In 1994, the increase in successful pairs and the high productivity of pairs resulted in the highest production of young (n = 74) ever recorded on the Tanana River. The previous high of 62 young occurred in 1993. From 1990-1995, an average of 73% of pairs have successfully raised young each year, with a mean of 2.10 young per total pairs and 2.85 per successful pair.

FALCONRY HARVEST

Following the delisting of arctic peregrines in 1994, regulations were passed in Alaska permitting a limited harvest of nestling peregrines from within the nesting range of arctic peregrines. In 1996, 3 nestlings were taken from the Sagavanirktok River, and 1 was taken from coastal NW Alaska. In 1997 and 1998, 2 nestlings were taken each year from the Sagavanirktok River.

CONCLUSIONS AND RECOMMENDATIONS

Peregrine falcons are widely distributed and locally common along the Sagavanirktok and Tanana River study areas. Since complete survey coverage of the Sagavanirktok River was initiated in 1991, the number of pairs of peregrines increased sharply from 1991-1992, leveled off and declined in 1993-1994, and has consistently increased from 1995-1998. Record high numbers of young were produced in 1997, and the second highest production of young was observed in 1998. On the

Tanana River, the number of pairs continued to increase through 1995 (the single survey in 1996 did not provide comparable data). Production on the Tanana also continued at a high rate in 1995.

Monitoring of delisted endangered species is suggested for at least 5 years. With harvest by falconers of arctic peregrines initiated in 1996, and proposals for harvest of American peregrines tied to delisting of that subspecies in the near future, we recommend the surveys on the Sagavanirktok and Tanana rivers be continued for at least 5 years following delisting.

ACKNOWLEDGMENTS

This project was funded by the US Fish and Wildlife Service. D. Davenport, S. DuBois, K. Peacock, R. Ritchie, S. Patten assisted with the field surveys. Alaska Department of Fish and Game staff in Delta Junction, Fairbanks, and Tok shared local information and provided logistical support. Alaska Division of Forestry staff, especially J. Lewandoski (Fairbanks), A. Edgren and J. Karoli (Delta Junction), and R. Kraemer (Tok), provided radio communication during the Tanana River survey. T. Doyle and H. Timm, Tetlin National Wildlife Refuge provided information and observations for the upper Tanana River. S. Ambrose, FWS Endangered Species, Fairbanks, provided logistical assistance and technical advice throughout the project.

LITERATURE CITED

BENTE PJ AND JM WRIGHT. 1992. Documentation of active peregrine falcon nest sites. Alaska Dep Fish and Game. Fed Aid in Wildl Restor. Final Rep. Proj SE-2-6. Juneau. 17pp.

—— AND ——. 1993. Documentation of active peregrine falcon nest sites. Alaska Dep Fish and Game. Fed Aid in Wildl Restor. Final Rep. Proj SE-2-7. Juneau. 17pp.

—— AND ——. 1994. Documentation of active peregrine falcon nest sites. Alaska Dep Fish and Game. Fed Aid in Wildl Restor. Final Rep. Proj SE-2-8. Juneau. 41pp.

CADE, TJ, JH ENDERSON, CG THELANDER AND CM WHITE. 1988. Peregrine falcon populations: their management and recovery. The Peregrine Fund, Inc. Boise, ID. 949pp.

HICKEY JJ, ED. 1969. Peregrine falcon populations: their biology and decline. Univ Wis Press, Madison. 596pp.

MESTA, R. 1998. Endangered and threatened wildlife and plants; proposed rule to remove the peregrine falcon from the list of endangered and threatened wildlife. Federal Register 60(126): 34406-34409.

ROSENEAU DG, EC TULL, AND RW NELSON. 1981. Protection strategies for peregrine falcons and other raptors along the planned Northwest Alaskan Gas Pipeline route. LGL Research Associates. Final Rep to Fluor Northwest. Contract No 478085-9-K127 Task II. 218pp.

SWEM, T. 1994. Endangered and threatened wildlife and plants; removal of Arctic peregrine falcon from the list of endangered and threatened wildlife. Federal Register 59: 50796-50805.

US FISH AND WILDLIFE SERVICE. 1982. Recovery plan for the peregrine falcon: Alaska population. Prepared by Region 7 FWS in cooperation with the Alaska Peregrine Falcon Recovery Team. US Fish and Wildl Serv, Anchorage. 69pp.

WHITE CM. 1968. Diagnosis and relationships of the North American tundra-inhabiting peregrine falcons. The Auk 85:179–191.

PREPARED BY:

John M Wright
Wildlife Biologist III

APPROVED BY:

_____
Wayne L. Regelin, Director
Division of Wildlife Conservation

SUBMITTED BY:

John M Wright
Wildlife Biologist III

_____
Steven R. Peterson, Senior Staff Biologist
Division of Wildlife Conservation

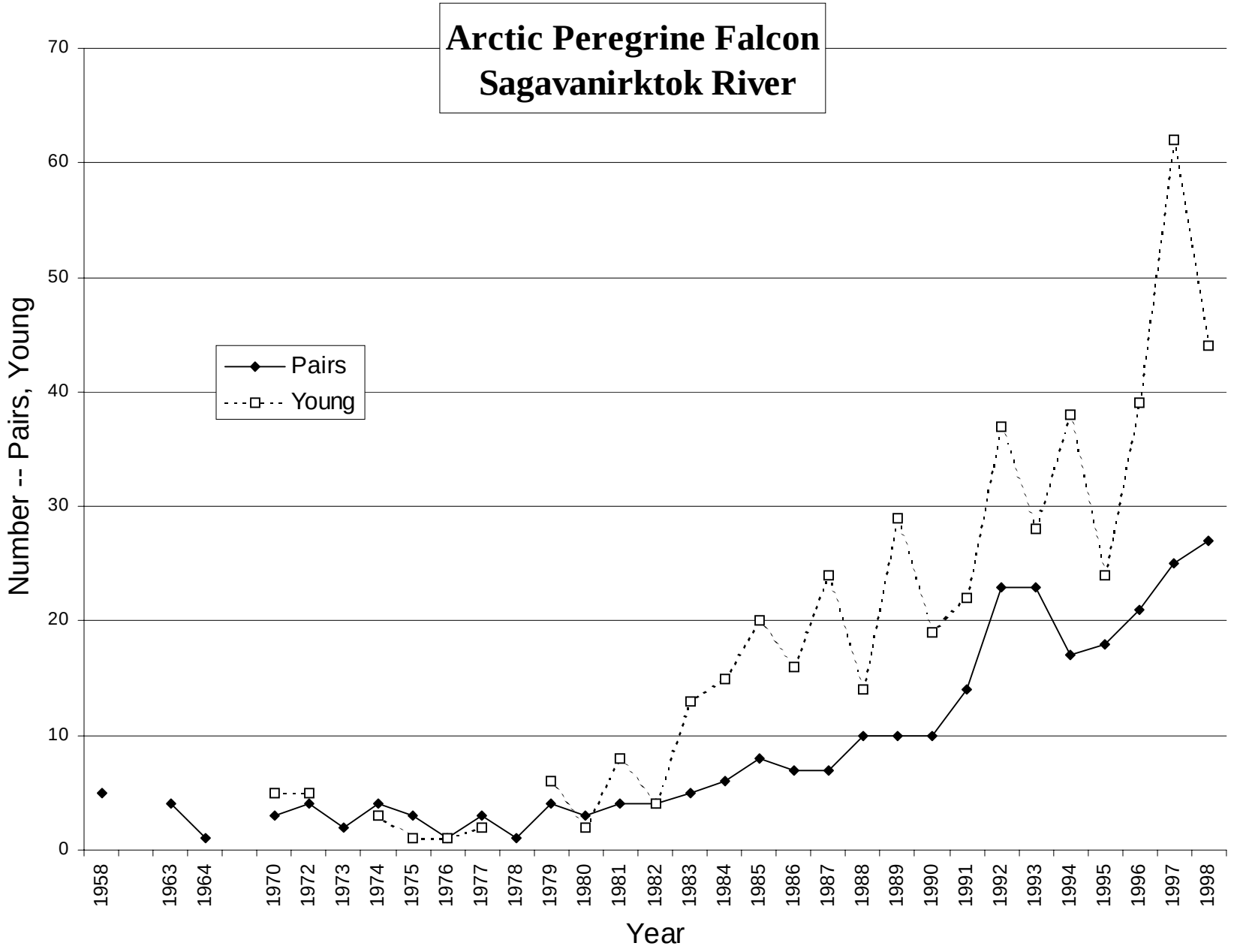

Figure 2 Number of pairs and young of arctic peregrine falcons, Sagavanirktok River, northern Alaska, 1958-1998

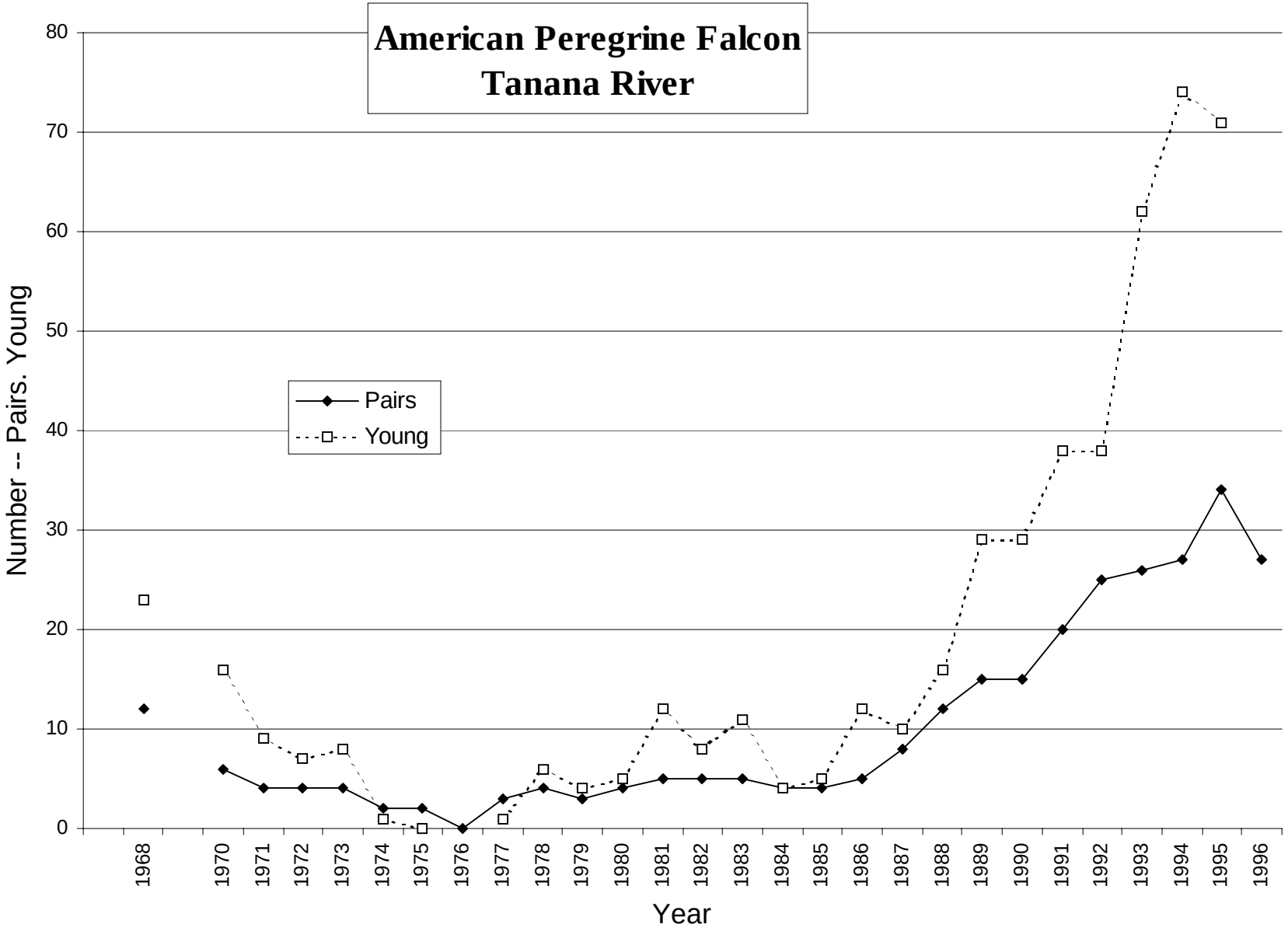

Figure 3 Number of pairs and young of American peregrine falcons, Tanana River, Interior Alaska, 1968-1996

Table 1 Surveys of peregrine falcons on the Sagavanirktok and Tanana rivers, Alaska, 1995–1998

River	Year	Number of Surveys
Sagavanirktok River	1995	2
	1996	1 (July-August)
	1997	1 (July-August)
	1998	1 (July-August)
Tanana River	1995	2
	1996	1 (May)

Table 2 Occupancy and productivity of Arctic Peregrine Falcons at sites on the Sagavanirktok River, Alaska, 1995–1998. [blank = not visited; V = vacant; L = lone adult; F = failed pair; S = successful pair, number = number of young; U = unknown]

Location	1995	1996	1997	1998
Slope Mountain	V	V		S 3
SAGA081.5	F	L	S 3	F
SAGA089.0-089.5		V	V	V
SAGA091.0		V	V	V
SAGA095.2	V	V	L	V
SAGA097.5			V	L
SAGA099.0-099.2	S 2	F	S 2	V
SAGA100.0			V	V
SAGA101.8	S 3	S 2	S 4	F
SAGA105.0	V	V	S 2	F
SAGA110.0-110.5	S 2	S 3	S 3	S 2
SAGA116.0	F	S 3	S 1	S 3
SAGA123.4-123.5	S 2	S 3	S 3	V
SAGA126.6		V	V	F
SAGA136.0	S 2	L	V	S 2
SAGA138.8		V	V	V
SAGA143.8-143.9	S 2	F	S 3	F
SAGA146.0-146.4		V	S 2	S 3
SAGA147.0-147.1	L	S 3	V	V
SAGA147.5			S 1	S 3
SAGA150.5-150.6	S 2	S 4	S 3	S 2
SAGA157.0	S 1	S 3	S 4	S 4
SAGA157.8-158.0	S 1	S U	S 2	S 2
SAGA158.5		S U	V	V
SAGA158.8-159.5	S 2	L	S 3	S 4
SAGA185.0		V	V	V
SAGA187.5-187.8	F	F	F	F
SAGA191.9		S 4	S 4	V
SAGA193.0-193.5		S 2	S 2	F
SAGA196.0-196.8		L	V	S 2
SAGA197.6-197.9	F	V	V	S 3
SAGA198.0-198.3		L	F	F
SAGA198.5-198.9		S 1	S 1	V
SAGA200.0	S 2	S 3	S 2	F
SAGA203.0	S 2	F	S 3	V
SAGA204.5-205.2	L	L	V	L
SAGA205.7		F	S 3	V
SAGA207.0-207.1	S 1	S 2	L	S 4
SAGA208.7	F	S 3	S 4	S 2
SAGA217.0	V	S 3	S 3	F
SAGA221.0			S 3	V
SAGA222.0				S 3
SAGA235.0				L
TOTALS				
L (Lone adult)	2	6	2	3
F (Failed pair)	5	5	2	11
S (Successful pair)	13	16	23	16
Number of young	24	39	62	44

Table 3 Historical occupancy and productivity of peregrine falcons, Sagavanirktok River, Alaska, 1958–1998[a]

	Occupancy			Productivity		
Year	Lone adults	Total pairs	Successful pairs[b]	Number of young[b]	Young per total pair	Young per successful pair
1958	0	5	U	U	--	--
1963	0	4	U	U	--	--
1964	0	1	U	U	--	--
1970	0	3	2	5	1.67	2.50
1972	1	4	2	5	1.25	2.50
1973	0	2	U	U	--	--
1974	1	4	2	3	0.75	1.50
1975	0	3	1	1	0.33	1.00
1976	0	1	1	1	1.00	1.00
1977	0	3	1	2	0.67	2.00
1978	0	1	U	U	--	--
1979	0	4	3	6	1.50	2.00
1980	1	3	1	2	0.67	2.00
1981	0	4	3	8	2.00	2.67
1982	0	4	2	4	0.67	2.00
1983	0	5	5	13	2.60	2.60
1984	1	6	6	15	2.50	2.50
1985	0	8	6	20	2.50	3.33
1986	0	7	6	16	2.29	2.67
1987	2	7	6	24	3.43	4.00
1988	0	10	6	14	1.40	2.33
1989	1	10	10	29	2.90	2.90
1990	2	10	7	19	1.90	2.71
1991	6	14	11	22	1.57	2.00
1992	2	23	15	37	1.60	2.47
1993	4	23	11	28	1.22	2.55
1994	4	17	14	38	2.24	2.71
1995	2	18	13	24	1.33	1.85
1996	6	21	16	39	1.86	2.44
1997	2	25	23	62	2.48	2.70
1998	3	27	16	44	1.62	2.75

[a]Data for 1958–1978 from a review by Roseneau et al. 1981. Data for 1979-1990 from US Fish and Wildlife Service, Endangered Species, Fairbanks unpublished summaries. Data for 1991–1994 from Bente and Wright 1992, 1993, 1994, and 1995. [b]U = Unknown

Table 4 Occupancy and productivity of American Peregrine Falcons at sites on the Tanana River, Alaska, 1995–1996. [blank = not visited; V = vacant; L = lone adult; F = failed pair; S = successful pair, number = number of young; P = pair; U = unknown]

Location	1995	1996
AKHY1275.2	S 2	
TANA093.5	F (2eggs)	
TANA103.2	S 3	P
TANA135.5	F	V
TANA181.7	S 3	L
TANA188.0	L	V
TANA205.0	S 3	P
TANA210.7	S 4	P
TANA221.5	S 2	P
TANA232.5	S 2	
TANA236.5	V	
TANA243.0	S 3	P
TANA244.5		V
TANA246.0	F	V
TANA247.5	S 2	P
TANA258.5	S 3	L
TANA269.5	S 3	P
TANA273.0	F	V
TANA280.0	S 2	P
TANA281.6	S 2	L
TANA283.5		P
TANA288.5	S 3	P
TANA299.0	S 2	L
TANA320.5	S 3	P
TANA337.0	F	V
TANA338.5	S 4	P
TANA372.0		P
TANA376.0	S 4	P
TANA379.8	S 4	P
TANA382.5	V	V
TANA386.0	F	P
TANA404.0		P
TANA408.0	F	P
TANA413.0		L
TANA414.5	S 3	V
TANA427.0	S 3	P
TANA430.7	S 3	P
TANA436.5	S 2	P
TANA438.4	L	P
TANA442.7	L	P
TANA460.0	F	L
TANA543.8	V	V
TANA550.0	S 3	P
TANA553.2		P
TANA586.0	S 3	P
TANA610.0	S U	P
TOTALS		
L (Lone adult)	3	6
F (Failed pair)	8	
S (Successful pair)	26	
P (Pair of adults in May)		27
Number of young	71	

Table 5 Historical occupancy and productivity of peregrine falcons, Tanana River, Alaska, 1968–1996[a]

	Occupancy			Productivity		
Year	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	--
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	3	34	26	71	2.09	2.73
1996	7	27	U[b]	U	U	U

[a] Data for 1968–1978 from a review by Roseneau et al. 1981. Data for 1979–1990 from US Fish and Wildlife Service, Endangered Species, Fairbanks, Alaska unpublished summaries. Data for 1991–1994 from Bente and Wright 1992, 1993, 1994, and 1995.
[b] U = unknown, no second survey

Alaska Department of Fish and Game
Division of Wildlife Conservation
October 2001

Documentation of Active Peregrine Falcon Nest Sites

15 May 2000–14 May 2001

John M. Wright
Peter J. Bente

Annual Research Performance Report
Endangered Species Conservation Fund
Federal Aid Project SE-2-12

This is a progress report on continuing research. Information may be refined at a later date.

RESEARCH PERFORMANCE REPORT

STATE: Alaska

COOPERATOR: USDI Fish and Wildlife Service

GRANT NO.: SE-2-12

STUDY TITLE: Documentation of Active Peregrine Falcon Nest Sites

AUTHORS: John M. Wright and Peter J. Bente

PERIOD: 15 May 2000 to 14 May 2001

SUMMARY

We surveyed American peregrine falcons (*Falco peregrinus anatum*) along the Middle and Lower sections of the Yukon River, and arctic peregrine falcons (*F. p. tundrius*) along the Norton Sound coast in 2001. Population monitoring began on the Yukon River study areas in 1979 and in Norton Sound in 1987, but these areas had not been surveyed since 1991. Periodic surveys of these areas complement annual monitoring of the primary study areas established in the Alaska Peregrine Falcon Recovery Plan (US Fish and Wildlife Service (FWS) 1982).

On two of the study areas the number of sites occupied by peregrines increased dramatically, on the Middle Yukon River up from 16 sites in 1991 to 32 in 2000, and in Norton Sound up from 35 sites in 1990 to 64 sites in 2000. Only a slight increase was recorded on the Lower Yukon River, from 59 sites with peregrines in 1991 to 62 in 2000. Productivity on the Yukon River in 2000 was lower than that recorded between 1979 and 1991.

Key words: *Falco peregrinus*, peregrine falcon, abundance, monitoring, nesting, Yukon River, Norton Sound.

CONTENTS

BACKGROUND

The peregrine falcon (*Falco peregrinus*) is a well-known species that suffered drastic declines and extirpations in North America during the 1960s as a result of pesticide contamination (Hickey 1969, Cade et al. 1988). Populations of 2 of the 3 subtaxa in Alaska (White 1968) declined significantly and were listed as endangered in 1970. The American peregrine falcon (*F. p. anatum*) nests in boreal and temperate forest regions and was delisted from endangered status by the federal government in 1999. The arctic peregrine falcon (*F. p. tundrius*) breeds in tundra regions. It was reclassified from endangered to threatened status by federal authorities in 1984, and delisted in 1994. Both the American and arctic peregrine falcons were removed from the Alaska State Endangered Species List in 1993 and placed on the Alaska Department of Fish and Game (ADF&G) list of Species of Special Concern. Peale's peregrine falcon (*F. p. pealei*), the third subtaxon in Alaska, lives in coastal regions of the state from the Aleutians south through the Gulf of Alaska and southeastern Alaska, and has never been classified as threatened or endangered. Unlike the American and Arctic subtaxa that are long-distance migrants wintering as far south as Argentina, Peale's peregrines are year-round residents of Alaska or short-distance migrants along the west coast of North America.

As part of a national program to restore peregrine falcon populations, the Alaska Peregrine Falcon Recovery Team developed a recovery plan for American and arctic peregrine falcons in Alaska (US Fish and Wildlife Service 1982). The plan recognized the importance of monitoring population trends, identifying nesting habitats and prey species, and protecting nesting areas from incompatible human activities. In addition to regular surveys of 4 representative study areas (Upper Yukon, Tanana, Colville and Sagavanirktok rivers), surveys were also recommended for other portions of the peregrines' range. The Middle and Lower Yukon River were surveyed annually from 1979 to 1991. The coastline of Norton Sound was surveyed each year from 1987 to 1991. Now that the peregrines are delisted, periodic surveys are conducted in those areas to monitor the status of the populations.

OBJECTIVES

1. Survey adult American peregrines along the middle Yukon River as part of the 5-year post-delisting monitoring of American peregrines.

2. Survey adult arctic peregrine falcons in the coastal Norton Sound region to complete the range-wide survey of arctic peregrines in Alaska.

3. Identify as many individuals as possible by reading coded color leg bands.

STUDY AREA AND METHODS

The Middle Yukon River study area is approximately 225 km of river frontage habitat in Interior Alaska (Fig. 1). Suitable cliff-nesting habitat occurs along this section of river from Ft. Hamlin to Tanana. The survey was completed on 24-28 July 2000 by out-board powered boat with

access from the bridge on the Dalton Highway approximately 150 miles north of Fairbanks, Alaska.

The Lower Yukon River study area is approximately 820 km of river frontage habitat in Interior Alaska. Suitable cliff-nesting habitat occurs along this section of river from near Ruby to Mountain Village. The survey was conducted during 10-20 July 2000. Compared to previous surveys, the entire study area was not covered in 2000; the area covered ranged from Ruby to near Holy Cross. The survey was completed by out-board powered boat with access from Galena, approximately 50 miles downstream from the beginning of the study area. We motored to the beginning of the study area, traveled downstream to near Holy Cross, and then returned to Galena.

Previous nesting sites and other areas of potential nesting habitat were checked with binoculars and spotting scopes to locate nesting birds. A Questar Field Scope with 16mm and 24mm ocular lenses was used to examine adults birds for color-leg bands. Observations were recorded on topographic maps, using GPS waypoints and catalogued by using a kilometer distance reference point. All observations are catalogued in the USFWS Alaska Raptor Database using a location number consisting of the river abbreviation and the kilometer reference point, e. g. YUKO689.5.

Nest site occupancy was classified as: vacant sites, single adults, failed pairs (no young produced), and successful pairs. Nestlings in accessible nest sites were banded with lock-on leg bands. No attempts were made to mark or band adult peregrine falcons.

From 10 to 14 June 2000 the coastline of Norton Sound was surveyed from Black Point, 48 km south of Unalalkeet, to Cape Prince of Wales, including the shorelines of Grantley Harbor and Tuksuk Channel near Teller. Three observers and the pilot of a Bell 206 Jet Ranger helicopter searched suitable coastal cliffs and bluffs from the air. At large seabird colonies we landed and searched on foot with binoculars to avoid disturbing the dense colonies of nesting birds. The survey followed the procedures developed in the late 1980s and early 1990s when peregrine surveys were first conducted in Norton Sound (Wright 1991), however only one early season (incubation period) survey was conducted in year 2000, rather than 2 complimentary surveys during incubation and pre-fledging or 1 late season survey as conducted in previous years. In addition to marking locations of observations on 1:63,360 scale USGS maps, latitude and longitude were recorded from the helicopter's GPS.

RESULTS AND DISCUSSION

Both the Middle Yukon and Lower Yukon study areas showed significant increases in occupancy by peregrine falcons in 2000. On the Middle Yukon in 1991 there were 2 singles, 4 failed pairs, and 10 successful pairs producing 23 young. In 2000 this increased to 7 singles, 7 failed pairs, and 18 successful pairs producing 30 young (Table 1, Appendix A). Since single falcons are attending potential nest sites, the population will likely continue to increase in the future. No previously color-banded adults were observed among the adults present at nest sites. This is not surprising considering that it has been 10 years since the last color bands were applied in this area. Since the survey was conducted late in July, all young were nearly fledged and, consequently, no nestlings were banded.

The Lower Yukon River study area showed less impressive increases in total site occupancy (Table 2, Appendix B). Since the entire Lower Yukon River was not surveyed in 2000, we do not have an estimate of the total population increase during the period between 1991 and 2000. For the section between Ruby and Anvik, in 1991 there were 11 singles, 13 failed pairs, and 35 successful pairs producing 89 young. In 2000, the same are contained 12 singles, 21 failed pairs, 30 successful pairs producing 63 young. The total number of pairs increased from 48 to 51, although total young decreased from 89 to 63. Delayed onset of spring conditions and cold, wet conditions during the summer season probably contributed to the lower number of young produced in 2000. No previously color-banded adults were observed among the adults present at nest sites. Some accessible nest sites had nestlings of suitable age for banding and 17 nestlings were banded during the survey.

Productivity (number of young per total pair and number of young per successful pair) ranged from 3.00 young per total pair in 1982 to 0.96 young per total pair in 2000 for the Middle Yukon River (Table 1). The low productivity in 2000 is likely the result of poor spring weather during nest site selection and cold, damp conditions during the summer. Similar variation in productivity occurs for the Lower Yukon River: 2.24 young per total pair in 1980 ranging to 1.29 young per total pair in 2000 (Table 2).

In Norton Sound we surveyed approximately 775 km of coastline, and found peregrines at 64 sites. Because of limited funding we were unable to make multiple passes when a bird was observed, so we did not obtain definitive information on presence of pairs versus single birds, or evidence of nesting. Also, during a single survey during incubation, such as this June 2000 survey, we would expect to overlook some tight-sitting incubating birds, so the proportion of peregrines detected in this survey is probably lower than in previous surveys in Norton Sound. The area surveyed in Norton Sound varied over the years. In 1990 and 1991, the coast south of Black Point to Stuart Island was included, and in some years offshore islands (Besboro, Sledge and others) were visited. Even with these limitations, a dramatic increase in the number of sites occupied by peregrines was detected (Table 3, Appendix C). Comparing results from just the area included in the year 2000 survey, peregrines were present at nearly twice as many sites in 2000 (64) as in 1991 (33) and 1990 (35).

In addition to peregrines, we recorded the following species in Norton Sound: bald eagle (*Haliaeetus leucocephalus*; observed at 2 sites, including 1 active nest), golden eagle (*Aquila chrysaetos*; 6,3), osprey (*Pandion halietus*; 1,1), gyrfalcon (*Falco rusticolus*; 6,3), merlin (*Falco columbarius*; 1,0), rough-legged hawk (*Buteo lagopus*; 20,11), and common raven (*Corvus corax*; 27,14). A red-tailed hawk (*Buteo jamaicensis*) was seen defending a nest with a second incubating adult on a cliff on the west side of Cape Darby near Golovin. Nesting phenology influences the sightability of each species. For example, early nesters, such as ravens, golden eagles and gyrfalcons, had already hatched (several ravens had already fledged) at the time of this survey in mid-June, so young in nests were conspicuous. Later nesters, like the peregrine and rough-legged hawk were still incubating and less conspicuous because adults often held tight on nests.

CONCLUSIONS AND RECOMMENDATIONS

The peregrine falcon populations along the Middle and Lower sections of the Yukon River, and in Norton Sound continued to expand during the decade from 1991 to 2000. Since single falcons were present at many suitable nest sites, there is room for continued gowth of the populations.

We recommend the area be surveyed every five to ten years to document the long-term trend in population recovery and expansion.

ACKNOWLEDGMENTS

This project was supported by Section 6 Endangered Species funds from the US Fish and Wildlife Service. The Koyukuk National Refuge in Galena provided the boat used on the Lower Yukon River and all logistical support for this part of the project. Special thanks are given to Mike Spindler for providing the funding support and encouragement to allow training for refuge staff. Randy Shaw, a volunteer for FWS from Ruby and FWS biologist Karin Lehmkuhl were enthusiastic observers and helped the project very much. For the survey on the Middle Yukon River, Skip Ambrose and the USFWS Endangered Species Office in Fairbanks provided a boat and logistical assistance for the project. Roger Seavoy, ADFG area biologist from Bethel, provided long hours of observation and helped to complete the survey in a short window of time. Jeff Hughes and Kim Titus of ADFG, and Erik Pentilla of Evergreen Helicopters ably assisted in the Norton Sound survey.

LITERATURE CITED

BENTE PJ AND JM WRIGHT. 1992. Documentation of active peregrine falcon nest sites. Alaska Dep Fish and Game. Fed Aid in Wildl Restor. Final Rep. Proj SE-2-6. Juneau. 17pp.

—— AND ——. 1993. Documentation of active peregrine falcon nest sites. Alaska Dep Fish and Game. Fed Aid in Wildl Restor. Final Rep. Proj SE-2-7. Juneau. 17pp.

■ AND ——. 1994. Documentation of active peregrine falcon nest sites. Alaska Dep Fish and Game. Fed Aid in Wildl Restor. Final Rep. Proj SE-2-8. Juneau. 41pp.

Cade, TJ, JH Enderson, CG Thelander and CM White. 1988. Peregrine falcon populations: their management and recovery. The Peregrine Fund, Inc. Boise, ID. 949pp.

HICKEY JJ, ED. 1969. Peregrine falcon populations: their biology and decline. Univ Wis Press, Madison. 596pp.

US FISH AND WILDLIFE SERVICE. 1982. Recovery plan for the peregrine falcon: Alaska population. Prepared by Region 7 FWS in cooperation with the Alaska Peregrine Falcon Recovery Team. US Fish and Wildl Serv, Anchorage. 69pp.

WHITE CM. 1968. Diagnosis and relationships of the North American tundra-inhabiting peregrine falcons. The Auk 85:179-191.

WRIGHT JM. 1991. Documentation of active peregrine falcon nest sites. Alaska Dep Fish and Game. Fed Aid in Wildl Restor. Final Rep. Proj SE-2-5. Juneau. 10pp.

PREPARED BY:

John M Wright
Wildlife Biologist III

APPROVED BY:

Wayne L. Regelin, Acting Director
Division of Wildlife Conservation

SUBMITTED BY:

John M Wright
Wildlife Biologist III

Steven R. Peterson, Senior Staff Biologist
Division of Wildlife Conservation

Table 1. Observations of American peregrines, Middle Yukon River, 1979-2000.

	Occupancy			Productivity		
Year	Lone adults	Failed pairs	Successful Pairs	Number of young[b]	Young per total pairs	Young per successful pair
1979	0	2	1	1	0.33	1.00
1980	0	2	4	11	1.83	2.75
1981	1	3	3	11	1.83	3.67
1982	0	0	6	18	3.00	3.00
1983	0	0	8	22	2.75	2.75
1984	1	1	5	14	2.33	2.33
1985	1	0	6	14	2.33	2.80
1986	2	3	4	12	1.71	3.00
1987	0	1	8	22	2.44	2.75
1988	1	2	8	20	2.00	2.50
1989	0	4	13	28	1.65	2.15
1990	4	0	11	16	1.45	1.45
1991	2	4	10	23	1.64	2.30
2000	7	7	18	24	0.96	1.33

Table 2. Observations of American peregrines, Lower Yukon River, 1979-2000.

	Occupancy			Productivity		
Year	Lone adults	Failed pairs	Successful Pairs	Number of young[b]	Young per total pairs	Young per successful pair
1979	7	4	18	36	1.64	2.00
1980	6	4	25	65	2.24	2.69
1981	7	11	24	66	1.89	2.75
1982	12	10	19	48	1.66	2.53
1983	10	8	31	75	1.92	2.42
1984	5	4	34	82	2.16	2.41
1985	10	7	31	73	1.92	2.35
1986	4	8	35	83	1.93	2.37
1987	9	6	37	85	1.98	2.30
1988	4	13	49	105	1.69	2.14
1989	14	14	52	105	1.59	2.02
1990	12	3	46	99	2.02	2.15
1991	11	13	35	89	1.85	2.54
2000	13	19	30	63	1.29	2.10

Table 3. Observations of arctic peregrine, Norton Sound coast, Alaska, 1987-2000.

	Occupancy			Productivity		
Year	Lone adults	Total pairs	Occupied Sites	Number of young[b]	Young per total pairs	Young per successful pair
1987 [a]	0	6	6	12	2.00	3.00
1988 [b]	1 or 2	19	20	34	1.79	2.62
1989 [c]	2	23	25	35	1.52	2.50
1990 [d]	10	27	37	53	1.96	2.52
1991 [e]	10	27	37	54	2.00	2.45
2000 [f]			64			

[a] 1 survey in July by boat and foot; Shaktoolik to Teller; no offshore islands

[b] 2 surveys, June and July, in helicopter; Black Point to Wales; Egg, Besboro and Sledge islands

[c] 2 surveys, June and July, in helicopter; Black Point to Wales; Sledge Island

[d] 2 surveys, June and July, in helicopter; Stuart Island to Wales; Sledge Island

[e] 1 survey in July; Stuart Island to Wales; Sledge Island

[f] 1 survey in June, Black Point to Wales; no offshore islands

Appendix A. Occupancy and productivity of American peregrine falcons at sites on the Middle Yukon River, Alaska, 1979-2000 [blank = not visited; V = vacant; L = lone adult; F = failed pair; S = successful pair, number = number of young; U = unknown. Data source: USFWS Alaska Raptor Database obsrec2.dbf]

Location	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	2000
YUKO658.8								L						S 2
YUKO663.5	F	F	F	S 4	S 4	F	L	F	S 1	F	S 1		F	
YUKO664.4														L
YUKO669.0														F
YUKO676.5								L			F	S U	S 1	F
YUKO678.9							S 2							L
YUKO682.5					S 4	S 3				S 2	F	S U	S 2	F
YUKO689.5			S 3		S 3	L						L		
YUKO690.2														L
YUKO693.3		S 2		S 2				S 4	S 4	S 3	S 3	S 4	F	S 3
YUKO698.5							S 3							S 1
YUKO705.5														S 1
YUKO711.3	F	F	L	S 4					S 3	S 2	S 2		S 3	F
YUKO711.5					S 3	S 3	S 2	S 3				S U		
YUKO719.2														S 2
YUKO725.8														F
YUKO728.7	S 1	S 4	S 4	S 3	S 1	S 2	S 1	F	S 3	L	S 3	L	S 3	S 3
YUKO752.8														S 2
YUKO755.5														S 2
YUKO758.7											S 2			F
YUKO771.7												S U	F	L
YUKO772.5											F			
YUKO777.5										S 3			S 2	S U
YUKO779.5											S 1	L		
YUKO810.2									S 2					
YUKO810.8		S 3	S 4	S 2	S 2			S 2		S 4	S 4	S 1	S 4	S 3
YUKO816.4			F		S 1	S 3	S 3	S 3	S 3	S 1	S 1	S 3	F	S 1
YUKO819.0											F	S 3	S 1	S 1
YUKO820.1														F
YUKO821.2													L	
YUKO824.8											S 3			
YUKO827.2													S 3	S 2
YUKO833.2														S 1
YUKO841.7								F						
YUKO842.3		S 2	F	S 3	S 4	S 3	S 3		S 2	S 1	S 1	S 3	L	S 1
YUKO847.9														S 2
YUKO849.7										F	S 2	S U	S 1	
YUKO852.5									S 4	S 4	S 3	S 2	S 3	S 2
YUKO858.5												L		S 1
YUKO860.2									F		S 2			L
YUKO867.0														L
YUKO882.1														L
TOTALS														
L (Lone adult)	0	0	1	0	0	1	1	2	0	1	0	4	2	7
F (Failed pair)	2	2	3	0	0	1	0	3	1	2	4	0	4	7
S(Successful pr)	1	4	3	6	8	5	6	4	8	8	13	11	10	18
Minimum young	1	11	11	18	22	14	14	12	22	20	28	16*	23	24*
PRODUCTIVITY														
Yng/total pair	0.33	1.83	1.83	3.00	2.75	2.33	2.33	1.71	2.44	2.00	1.65	1.45	1.64	0.96
Yng/successful pr	1.00	2.75	3.67	3.00	2.75	2.80	2.33	3.00	2.75	2.50	2.15	1.45	2.30	1.33

Appendix B. Occupancy and productivity of American peregrine falcons at sites on the Lower Yukon River, Alaska, 1979-2000 [blank = not visited; V = vacant; L = lone adult; F = failed pair; S = successful pair, number = number of young; U = unknown, NS = not surveyed. Data source: USFWS Alaska Raptor Database obsrec2.dbf]

Location	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	2000
YUKO954.3								S 3	S 1	S 3	L,S1	S U		
YUKO1072.8							S 2	S 3	S 4	S 3	S 1	S 3	S 4	S 3
YUKO1078.8									S 1		S 1			F
YUKO1080.4			F			S 3	L			S 2	F	L	S 2	F
YUKO1090.0											S 1			S 2
YUKO1094.5				L					F					S 1
YUKO1096.6											S 3			
YUKO1098.3													L	
YUKO1103.7					L	S 2	S 3	S 2	S 3	F	S 3	S 4	S 2	S 2
YUKO1108.0													S 2	
YUKO1108.8												S 2	L	F
YUKO1110.5	S 3	S 4	L	S 4	S 4	S 3	S 4	S 3	S 3	S 2	S 1		F	F
YUKO1112.8											F	S U	S 1	S 2
YUKO1122.2														F
YUKO1132.7		S 1	S 3	S 3	S 2	S 2	S 3	S 3	F	S 1	S 2	F		S 2
YUKO1138.4										S 1	F	S 2		S 3
YUKO1141.5														L
YUKO1154.1										L	F			
YUKO1194.0	S 3	S 2	S 2	S 3	S 2	S 2	S 2	F	S 3	S 3	L,F	S 2	S 3	L
YUKO1205.0									S 1	F	L		F	S 3
YUKO1207.3	F	S 4				S 2	F					L	F	L
YUKO1209.0	S U		L	S 2	S 2		L	S 2	S 3	S 3	S 3	S U	F	F
YUKO1225.2								S 2	S 4	S 2	S 2		S 3	
YUKO1227.2													S 1	
YUKO1228.6	F	S 4	F	L	S 1	L	L	F	L	S 1	S 1	S 2	L	S 3
YUKO1230.8											L			
YUKO1231.0														S 2
YUKO1232.9			L	F	F	S 4	S 2		L	F	S 3	S 2	S 4	
YUKO1233.5														L
YUKO1240.4	L		S 3		S 1	L	S 2	S 2	S 3	S 2	S 3	S 2	F	L
YUKO1250.5											S 3	S 4	S 3	
YUKO1256.2									S 1	S 2	S 3	S 3	S 4	S 3
YUKO1260.1									S 3	S 2			L	F
YUKO1261.5											S 3	S U	F	F
YUKO1266.5									L	S 3	S 1		S 1	F
YUKO1269.0	L	S 4	S 3	S 3	S 2	S 3	S 3	S 1	S 1	S 1	F		S 2	L
YUKO1270.3										S 3	S 2		S 1	
YUKO1271.5								S 1						F
YUKO1276.3	L	S 3	S 4	S 3	S 1	S 3	S 3	S 2	S 2	S 3	S 2		S 3	F
YUKO1279.0					L									S 3
YUKO1279.6												L	S 2	
YUKO1282.5			L		L	S 2	S 3	F	S 3	S 2	S 2		S 3	L
YUKO1287.5														S 3
YUKO1291.3			L	S 2	S 1	S 3			S 3	F	S 4		S 1	F
YUKO1305.5														L
YUKO1309.5	S 2	F	S 1	S 2	S 3	S 3	S 4	F		S 1	S 4	S 4	F	F
YUKO1316.8									F					
YUKO1322.6												L	F	
YUKO1323.3														L
YUKO1325.4	L	S 4	S 4	F	S 2	S 2		F	S 2	S 2	F	F		
YUKO1326.8													F	
YUKO1330.6	F	S 2	S 3	L	S 3	F	S 1	S 1	L	F	S 2	L	S 3	S 3

Location	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	2000
YUKO1331.6													S 4	S 2
YUKO1338.5							S 3		F	S 3		L		
YUKO1339.0	L												S 3	
YUKO1339.7		S 3	S 4	S 4	S 3	S 4		S 3			S 3	S U	L	F
YUKO1345.1												S 1		F
YUKO1350.0										F	L		S 3	
YUKO1363.5				L	S 2	S 3					S 4	L		S 1
YUKO1364.5														L
YUKO1365.7							S 3	S 3	S 2	S 4	F	S 3	S 1	
YUKO1367.8		S 2		S 3					S 1	L		S 3	S 1	S 2
YUKO1368.7	S 2		S 3		S 1	S 2	S 2	S 3		S 2	L,SU	S 4	F	S 1
YUKO1373.4			F		S 3	S 2	F	S 1	S 1	S 3	S 3		L	S 1
YUKO1399.0	S 4	L	F	L	F	F	S 1	L		S 2	F	S 2	F	F
YUKO1421.8													L	
YUKO1425.0	F	F		F	S 3	S 1	F					S 3	S 3	
YUKO1425.6								S 2	S 1	S 2	S U			
YUKO1430.5													S 3	L
YUKO1432.0	L	S 3	F	L	S 3			S 2		S 3	F	L	L	
YUKO1433.0												L	S 3	
YUKO1435.0										S 2	F	S 2	S 2	F
YUKO1438.5			F	S 2	S 3	S 4	S 1		L	F	S 2	S 3	S 4	S 2
YUKO1441.5								F	L	S 3	F		S 1	L
YUKO1451.8	S 3		F	S 1	F		S 1	S 2	S 2	S 3	S 3	S 4	S 4	S 2
YUKO1474.0													L	
YUKO1481.4	S 2													
YUKO1482.3		S 3	S 4	S 3	S 3	S 2	S 2	S 3	S 3	F	F	S 3	S 4	S 2
YUKO1485.0														S 3
YUKO1487.2										S 1	S 1	S U	S 2	
YUKO1498.6											L	F		
YUKO1500.7		S 3	S 3			S 2	S 3			S 3	S 1		L	
YUKO1502.8				S 1			L	S 2	S 2			S U	S 4	
YUKO1508.5											S 4	S 2	F	S 2
YUKO1509.5										S 2				
YUKO1510.4	S 1	S 4	S 4	S 4	S 3	S 1	F	S 1	S 1	S 1	S 3	S 3	F	F
YUKO1512.0											L		L	S 1
YUKO1516.5										L				
YUKO1520.2			F	L	S 2					S 2	F	S 2	S 2	S 2
YUKO1522.1						S 2	F	S 3	S 2				NS	
YUKO1542.9		S 2	S 1	S 2	F	S 3	S 1		F	S 2	S 2	S 3	NS	S 1
YUKO1547.9	S U	S 2	S 3	F, L	S 1		S 3	S 4		S 1		S 3	NS	F
YUKO1548.2					L	L,S3	L	F			L		NS	
YUKO1573.2					L					S 2			NS	S 3
YUKO1578.5		S 1	S 1	L	F	S 2	F	S 4	S 1	F	S 3	S 3	NS	F
YUKO1609.0	S 2	S 1	S 1	S 2	F		F	S 2	F	S 1	S 1	S 3	SN	L
YUKO1609.8													NS	S 2
YUKO1614.5	S 2	S 2	S 1	L	L	L	S 3	S 4	S 1	F	S 2	S 1	NS	S 1
YUKO1620.6			S 2	F	S 3	S 3	S 3	S 2	S 1				NS	NS
YUKO1621.5	S 3	S 2								S 2	F		NS	NS
YUKO1627.5					L	S 2		S 2		S 2	S 3		NS	NS
YUKO1632.3	S 3	S 3	L		S 3		S 3		S 2	F	S 3		NS	NS
YUKO1635.5										F	S 3		NS	NS
YUKO1638.8	S 1	S 2	S 4	S 1	S 4	S 1	S 3	S 4		L	S 3	S 3	NS	NS
YUKO1641.8				F	S 2	S 3	S 2	S 2			L		NS	NS
YUKO1643.5			F						S 3	S 2	S 3	S 3	NS	NS
YUKO1671.2					S 2	S 2							NS	NS
YUKO1671.5		L	S 4	F			S 1	L	S 4	S 1	S 3	S 1	NS	NS
YUKO1689.0												S 3	NS	NS
YUKO1699.8		S 2	F	F	F	F	L	S 3	S 4	S 4	S U	L	NS	NS
YUKO1708.4	S 1	F	F	F					L				NS	NS
YUKO1708.5							L			S 1	S U	S 2	NS	NS

Location	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	2000
YUKO1709.2					L	F			L				NS	NS
YUKO1709.5					L								NS	NS
YUKO1709.8											S 3		NS	NS
YUKO1710.1								S 1					NS	NS
YUKO1727.7											L		NS	NS
YUKO1729.7	S 4	L	S 4	F	S 4	S 2	S 3	F	S 4	F	S U	S 2	NS	NS
YUKO1731.4											S U		NS	NS
YUKO1741.5	S U	S 2	S 4	L								L	NS	NS
YUKO1742.2					S 1	S 3	L	L	L	S 2	S U		NS	NS
YUKO1757.0											S U		NS	NS
YUKO1758.5		L	S 2	S 3	S 3	S 1	S 1	S 3	S 3	S 2	L	L	NS	NS
YUKO1759.6	L	F					L	L		S 2	L	S 2	NS	NS
YUKO1773.3							L		S 3	S 1	L	S 3	NS	NS
YUKO1851.0		L				L							NS	NS
YUKO1851.8				L	L		S 2						NS	NS
YUKO1853.6					F								NS	NS
YUKO1855.1		L	L					S 2	S 3	S 2	S 1	S U	NS	NS
YUKO1893.0												S 2	NS	NS
TOTALS														
L (Lone adult)	7	6	7	12	10	5	10	4	9	4	14	12	11	13
F (Failed pair)	4	4	11	10	8	4	7	8	6	13	14	3	13	19
S(Successful pr)	18	25	24	19	31	34	31	35	37	49	52	46	35	30
Minimum young	36	65	66	48	75	82	73	83	85	105	105	99	89	63
PRODUCTIVITY														
Yng/total pair	1.64	2.24	1.89	1.66	1.92	2.16	1.92	1.93	1.98	1.69	1.59	2.02	1.85	1.29
Yng/successful pr	2.00	2.69	2.75	2.53	2.42	2.41	2.35	2.37	2.30	2.14	2.02	2.15	2.54	2.10

Appendix C. Observations of arctic peregrines in Norton Sound, June 2000

Km #	Site	Latitude	Longitude	Peregrines Observed
NORT220.4	Black Point	63.553	161.112	1, inc
	Tolstoi Pt	63.623	161.001	1 ad fly
		63.632	160.957	1,M perched
		63.678	160.880	1, perched
		63.707	160.840	2,pair
NORT281.4	Blueberry Pt	63.997	160.898	2,pair
	Egavik N	64.052	160.940	1,flushed
		64.057	160.942	1,M flushed
		64.087	160.947	1,flushed
ca NORT296		64.103	160.943	1,fly
NORT299.5	Junction Crk N	64.137	160.955	2,pair inc
		64.165	160.953	1,flushed
		64.182	160.955	1,flushed
ca NORT306		64.190	160.958	2,pair
		64.402	161.503	1,flushed
NORT357.9	Cape DenbighTip E	64.378	161.528	1,inc
		64.500	161.530	1,inc
NORT362.1		64.400	161.522	1
		64.407	161.525	1,flushed
	Reindeer Hills	64.430	161.495	1
		64.440	161.482	1

NORT372.0		64.482	161.482	1,inc
		64.498	161.467	2,pair
NORT408.8	Island Pt	64.587	161.085	1,flushed
		64.810	161.345	2,inc
NORT497.1	Baldhead E	64.773	161.375	1
NORT500.7		64.760	161.423	1,flushed
		64.760	161.435	1,perched
		64.758	161.470	1,brown
ca NORT551	Elim N	64.627	162.230	1
		64.605	162.285	2,inc
		64.585	162.362	2,pair
		64.573	162.408	1,perched
		64.582	162.377	1,flushed
		64.520	162.557	1
		64.503	162.575	1,flushed
ca NORT599	Vuarnet E	64.363	162.712	1,M flushed
		64.350	162.743	1,perched
NORT603.8	Cape Darby Tip	64.332	162.770	1,perched
		64.325	162.785	1,perched
		64.357	162.810	1,fly
		64.372	162.803	1,flushed
		64.380	162.798	1,M
		64.405	162.807	2,pair
		64.425	163.102	1,perched
		64.403	163.135	1,fly
NORT718.1	Rocky Pt	64.398	163.167	1,M perched

		64.412	163.195	1
		64.445	163.238	1,inc
ca NORT735		64.492	163.327	2,pair
NORT752.4	Square Rock	64.565	163.617	2,pair
NORT754.7	Koyanna Crk, Bluff	64.567	163.673	active
NORT757.2	Bluff, highest	64.567	163.728	? Not visited
		64.560	163.898	1
	Topkok E Thumb	64.557	163.955	1,perched
NORT774.1	Topkok W	64.553	163.997	1,perched
NORT826.8	Cape Nome	64.437	165.005	1,defend
	Moon Mtn W	64.756	166.385	1,fly
NORT983.1	Cape Riley N	65.225	166.467	2,pair, inc
		65.233	166.168	2,pair, inc stick nest
	Lost River E	65.393	167.122	1
ca NORT1076	Kotzebue Crk EE	65.395	167.722	1,F flushed
	King River W	65.408	167.420	1
		65.415	167.457	1,flushed
		65.525	167.772	1, fly
	Wales Mtn			none