U.S. Fish and Wildlife Service

DRAFT ENVIRONMENTAL ASSESSMENT AND MANAGEMENT PLAN

TAKE OF MIGRANT PEREGRINE FALCONS FROM THE WILD FOR USE IN FALCONRY

DIVISION OF MIGRATORY BIRD MANAGEMENT

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Division of Migratory Bird Management

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ABSTRACT

- In this Draft Environmental Assessment (DEA) we consider only the take of wild first-year migrant (passage) peregrine falcons for use in falconry.

- For the purposes of this assessment, we identified three management populations of peregrine falcons in North America and Greenland: (1) Northern, consisting of peregrine falcons of the American (*Falco peregrinus anatum*) and Arctic (*F. p. tundrius*) subspecies originating at natal sites at or north of 54° N latitude; (2) Western, consisting of all peregrine falcons originating from natal sites at or west of 100° W longitude and south of 54° N latitude (both *F. p. anatum* and Peale's peregrines (*F. p. pealei*)); and (3) Eastern, consisting of all peregrines (*F. p. anatum* and individuals of all other subspecies released there for management purposes) originating from natal sites east of 100° W longitude and south of 54° N latitude.

- Our management goal is to allow a reasonable harvest of migrant Northern peregrines while simultaneously (1) not increasing cumulative harvest of the U.S. portion of the Western or the Alaskan segment of the Northern population to a number greater than 5% of estimated annual production (following the framework established in USFWS [2006]); and (2) having minimal impact on non-target populations by holding take of peregrines from the Canadian portion of the Western population and the Eastern population to less than 1% of annual production.

- We considered six alternatives for the harvest of passage peregrines. At the request of the Association of Fish and Wildlife Agencies, we considered, as one alternative, a harvest of passage peregrines limited to areas of the United States south of 31° N latitude and east of 100° W longitude between 20 September and 20 October annually.

- We analyzed the likely effects of harvest under the six alternatives using band recovery data for peregrines that had been banded as nestlings and re-encountered during their first year, and the best available estimates of population size for each management population. From these data sets, we estimated the proportion of each management population's first-year cohort that potentially would be exposed to harvest risk annually under each alternative, and, assuming harvest was in proportion to availability, the likely makeup of harvest.

- The preferred alternative is to allow a sexually-balanced annual harvest of up to 105 first-year peregrine falcons between 20 September and 20 October from areas of the U.S. south of 31° N latitude and east of 100° W longitude, and to expand authorization of take of peregrines in Alaska to include first-year migrants and fledged young of all subspecies. Coordination necessary to ensure appropriate allocation of harvest among harvest states (including states where nestling harvest occurs, so that cumulative harvest levels remain within the limits established here) is expected to occur within and among the four existing Flyway Councils.

- The preferred alternative also allows for an annual falconry harvest of up to 2 passage Northern peregrines in Canada and up to 25 in Mexico. These levels are believed to be consistent with the current levels of harvest in the two countries.

INTRODUCTION

Wild-caught migratory peregrine falcons (*Falco peregrinus*) were used regularly by North American falconers for the practice of falconry (Ward and Berry 1972) from 1938 until 1970, when two harvested subspecies were added to the list of Threatened and Endangered Wildlife and Plants (50 Code of Federal Regulations [CFR] Part 17.11) by the USFWS (1998). The decline of peregrines worldwide has been strongly tied to widespread application of several chlorinated hydrocarbon pesticides, among them DDT and Dieldrin (Nisbet 1988). Restrictions on the use of these pesticides in Canada and the United States, in 1970 and 1972 (USFWS 1998) respectively, resulted in the slow recovery of peregrine populations (Kiff 1988). Peregrines from northern latitudes recovered fastest (although numbers there were perhaps never as reduced in size as in temperate latitudes), and the Arctic peregrine (*F. p. tundrius*) was removed from the federal endangered species list in 1994 (USFWS 1998). Even though most migratory peregrines taken by falconers were *F. p. tundrius*, resumption of harvest outside Alaska was precluded by the designation of all free-ranging peregrines in the lower 48 states as endangered by similarity of appearance to the American peregrine falcon (*F. p. anatum;* the subspecies of peregrine that occupied much of interior and sub-arctic North America), which remained listed as endangered (USFWS 1998).

In 1995, the USFWS initiated a review of the status of *F. p. anatum* (USFWS 1998), which eventually concluded the subspecies warranted de-listing. Removal of *F. p. anatum* from the federal list of Threatened and Endangered Wildlife and Plants occurred in 1999 (USFWS 1999a). In anticipation of this action, in September 1998, the International Association of Fish and Wildlife Agencies (IAFWA, now the Association of Fish and Wildlife Agencies, or AFWA), acting on behalf of all 50 state wildlife agencies, established a working group to determine if the resumption of a harvest of peregrines by falconers in the lower 48 states was biologically justifiable, and if so, to recommend acceptable biological and implementation criteria for the harvest. The AFWA working group polled state wildlife agencies and found support for a resumption of the harvest, but with the caveat that peregrines from breeding sites in the eastern United States and southeastern Canada be protected from take (Taubert *et al*. 1999). The basis for this concern was that the recovery of peregrine falcons in temperate eastern North America was not as complete as elsewhere in North America, and concerns remained for the status of the species in this geographical segment of its range at the time of delisting (Millsap *et al*. 1998).

The AFWA working group evaluated banding data through 1999 for peregrines and constructed a proposed harvest framework that provided considerable protection for peregrines originating from areas of concern in eastern North America (Taubert *et al*. 1999). The recommended AFWA framework was to: (1) allow the falconry take of up to 5% of the estimated production of young at peregrine falcon nest sites west of the 100th meridian; and (2) to allow the take of up to 5% of the estimated production of young by high-latitude peregrines, but with the harvest only occurring in the area

east of the 100th meridian and south of 31° N latitude during the period 25 September through 15 October. This area and time-frame were chosen because analyses for the AFWA indicated that harvest under these restrictions would minimize the risk of harvest of first-year migrant peregrines that originate in the eastern U.S. and southeastern Canada. A majority of the affected states supported this harvest framework, therefore, the recommendations were adopted by AFWA and forwarded to the USFWS.

In October 1999, we published a notice of intent to develop two separate Environmental Assessments (EAs); one for the take of wild nestling *F. p. anatum* west of the 100th meridian, and another for the take of autumn migrants, primarily *F. p. tundrius* (USFWS 1999b). In 2001, we published an assessment of the potential falconry take of nestling *F. p. anatum* west of the 100th meridian (USFWS 2001). The recommended alternative in that EA, which closely resembled the AFWA proposal, was implemented in May 2001. We withdrew the assessment in 2002, and harvest was not allowed that year. We issued a revised EA in 2004 (USFWS 2004), and the harvest of nestling peregrine falcons resumed that year. Subsequent legal challenges to that action were resolved in favor of the USFWS.

This Draft Environmental Assessment (DEA) constitutes the second action proposed by the USFWS in the 1999 Notice of Intent. Herein we present and evaluate the likely consequences of six alternatives for implementing a harvest of first-year autumn migrant (passage) peregrine falcons.

PURPOSE AND MANAGEMENT OBJECTIVES

In this assessment we consider the effects of a harvest of first-year autumn migrant peregrine falcons from the wild for use in falconry. Specifically, we evaluate estimated impacts to biologically and geographically defined peregrine falcon populations that would result from a harvest of autumn migrants in different geographic regions of the U.S. The harvest would be by licensed falconers, who operate under falconry regulations at Title 50 of the Code of Federal Regulations (50 CFR 21.28 and 21.29).

Based on perceived preferences of falconers and the desired maintenance of the peregrine falcon population at a healthy level, our preferred alternative will be that which affords maximum potential harvest opportunity over the largest geographic harvest area while simultaneously adhering to biologically derived limits on the harvest of various geographic populations of the peregrine, as described below. More specifically, our explicit management goal in the DEA is to allow the maximum safe harvest of first-year peregrines of the Northern management population (see Biogeography and Distribution section for population descriptions), while simultaneously (1) not exceeding the acceptable cumulative harvest of the U.S. portion of the Western management population or the Alaskan segment of the Northern management population, following the framework established in USFWS (2006); and

(2) having minimal impact on non-target populations by holding take of peregrines from the Canadian portion of the Western population and the Eastern population to less than 1% of annual production. The maximum safe harvest for the Canadian portion of the Western population and the Eastern population segments is based on Millsap and Allen (2006), who concluded a 1% harvest rate was not likely to negatively impact any of the raptor species evaluated, including peregrine falcons. The management goal is also to achieve relative sexual parity in the harvest (*i.e.*, a sex ratio no greater than 60:40 in either direction), and a geographic distribution in harvest proportional to relative population size.

This assessment does not consider the harvest of nestling peregrine falcons from nest sites east of the 100th meridian in the U.S. We will evaluate falconry harvest of nestling Eastern peregrines in a separate assessment, if it is warranted.

NEED FOR ACTION

Possession of a trained raptor listed under 50 CFR Part 10 for falconry or propagation is authorized only under a permit issued under the federal regulations at 50 CFR 21.28 and 21.30. Currently, take and possession of migrant wild peregrine falcons by falconers is prohibited by specific language on the face of each falconer's permit. This limitation was enacted following the delisting of *F. p. anatum* to ensure that resumption of harvest was implemented in a deliberative manner after consideration of all possible impacts to the species. In 1999, the AFWA requested that the USFWS undertake such an analysis relative to a harvest of migrant Northern peregrines. This DEA constitutes that review, and will serve as a management plan for harvest if it is allowed.

SCOPING AND PUBLIC PARTICIPATION

We published a Notice of Intent to Prepare a DEA on harvest of nestling Western *F. p. anatum* and migrant Northern peregrine falcons in October 1999 (USFWS 1999b). Substantive comments received in response to that notice were considered in the preparation of this DEA.

AUTHORITY AND RESPONSIBILITY

Regulations allowing the take of migratory birds are authorized by the Migratory Bird Treaty Act (MBTA) (16 U.S.C. Sections 703-712), which implements the four bilateral migratory bird treaties the U.S. entered into with Canada, Mexico, Japan, and Russia. The MBTA authorizes the Secretary of the Interior to allow people to hunt,

take, possess, sell, purchase, and transport migratory birds if those actions are compatible with the provisions of the treaties (16 U.S.C. Section 704).

AFFECTED ENVIRONMENT

BIOGEOGRAPHY AND DISTRIBUTION

Three subspecies of peregrine falcon are recognized in North America: *F. p. pealei*, the maritime, or Peale's peregrine; *F. p. tundrius*, and *F. p. anatum* (White *et al*. 2002). Although *F. p. tundrius* is considered taxonomically distinct from *F. p. anatum* at the subspecies level, in the interior of Alaska and northern Canada these subspecies may intergrade such that they overlap considerably in plumage and morphology, and both are strongly migratory in contrast to *F. p. pealei* and *F. p. anatum* in temperate North America (White and Boyce 1988; Taubert *et al*. 1999). Because of phenotypic similarity and similar migratory behaviors, it is difficult to separate high-latitude *F. p. anatum* from *F. p. tundrius* outside their respective breeding areas.

Peregrines from more temperate areas south of 54° north latitude migrate less markedly and many overwinter within their breeding range (Taubert *et al*. 1999). Peregrines in the eastern part of this range have recovered more slowly than those in the west, and for management it is desirable to distinguish between these two groups. For the purposes of this plan, we identified three management populations of peregrine falcons in North America and Greenland: (1) Northern, consisting of *F. p. anatum* and *F. p. tundrius* subspecies originating at natal sites at or north of 54° N latitude; (2) Western, consisting of all peregrine falcons originating from natal sites at or west of 100° W longitude and south of 54° N latitude (both *F. p. anatum* and *F. p. pealei*); and (3) Eastern, consisting of all peregrines (*F. p. anatum* and individuals of all other subspecies released there for management purposes) originating from natal sites east of 100° W longitude and south of 54° N latitude. The relationship between taxonomic and management populations is shown in Figure 1.

POPULATION SIZE

Peregrine falcons are monitored regionally by a variety of surveys, but for most management populations the certainty of our knowledge of population size and productivity has decreased as populations have recovered, and monitoring has decreased. The ranges of recent available estimates of numbers of breeding pairs of peregrine falcons in each management population are provided in Table 1, along with source citations. Based on these data, we believe the Northern population consists of 2,748 to 7,505 pairs, the Eastern population consists of about 392 pairs, and the Western population consists of 1,513 to 1,964 pairs.

The number of young fledged per adult territorial pair is a common measure of reproductive success in raptors (Steenhof 1987). Ranges of regional estimates of productivity for North American peregrine falcons are given in Table 2. Based on

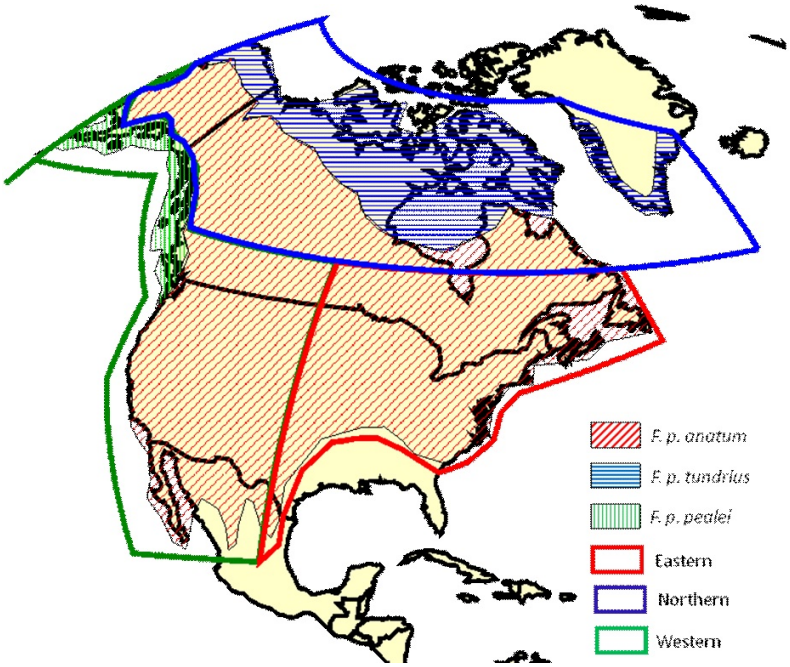

Figure 1. Map showing relationship between taxonomic and management populations for North American peregrine falcons. Taxonomic subspecies boundaries follow White and Boyce (1988); in reality, the boundaries are uncertain and likely intergrade into one another. The red hatched area denotes the range of *F. p. anatum*, the green hatched area denotes the range of *F. p. pealei*, and the blue hatched area denotes that of *F. p. tundrius*. The heavy red line denotes the boundary of the Eastern management population, the heavy green line denotes the Western management population, and the heavy blue line borders the Northern management population.

data presented in Tables 1 and 2, we estimate that between 6,569 and 15,131 young peregrine falcons are produced annually in North America (Table 2). Estimates of numbers of young fledged may be positively biased because deaths of nestlings do occur after productivity counts are conducted, and pairs that fail to lay eggs are hard to detect and therefore lead to underestimates of the number of pairs that are actually present (Steenhof 1987). We know of no studies that provide widely applicable correction factors for these biases, but we believe it is unlikely they lead to overestimates of productivity by more than 10%. Therefore, for assessment purposes, we use a conservative, adjusted range for annual peregrine falcon production that is 10% lower than the range estimated in Table 2; we consider the range for annual production of peregrines in North America and Greenland for management purposes to be between 5,912 and 13,618 young fledged annually.

MIGRATION BIOLOGY

Taubert *et al*. (1999) identified migration timing and distance as important factors in harvest management for migrant peregrine falcons. We used band recovery

Table 1. Maximum and minimum population size estimates, based on most recent counts or projections, for North American peregrine falcon populations.

Minimum number of pairs	Maximum number of pairs	Population	Place	Source
1,000	1,000	Northern	Interior Alaska	Green *et al*. 2006
225	225	Northern	Arctic Alaska	USFWS, in Enderson *et al*. 1995
1,143		Northern	Canada	G. Holroyd, Canadian Wildlife Service, personal communication, in Taubert *et al*. 1999
	4,350	Northern	Canada	Enderson *et al*.1995
450		Northern	Greenland	Enderson *et al*. 1995
	2,000	Northern	Greenland	W. G. Mattox, Conservation Research Foundation, personal communication in Taubert *et al*. 1999
2,818	7,575	Northern	Total	
336	336	Eastern	Eastern U.S.	Green *et al*. 2006
22	22	Eastern	Labrador and Newfoundland	Rowell *et al*. 2003
11	11	Eastern	Bay of Fundy, Nova Scotia, New Brunswick	Rowell *et al*. 2003
28	28	Eastern	S Quebec	Rowell *et al*. 2003
53	53	Eastern	S. Ontario	Rowell *et al*. 2003
3	3	Eastern	S. Manitoba	Rowell *et al*. 2003
453	453	Eastern	Total	
4	4	Western	S. Saskatchewan	Rowell *et al*. 2003
23	23	Western	S. Alberta	Rowell *et al*. 2003
1	1	Western	Interior British Columbia	Rowell *et al*. 2003
	11	Western	Lower British Columbia, Victoria Island	Rowell *et al*. 2003
	29	Western	N. Alberta	Rowell *et al*. 2003
	35	Western	Yukon, Porcupine River	Rowell *et al*. 2003
	22	Western	Peel River, Yukon	Rowell *et al*. 2003
	46	Western	Yukon River	Rowell *et al*. 2003
	46	Western	S. Lake Yukon	Rowell *et al*. 2003
	80	Western	Mackenzie Valley, NWT	Rowell *et al*. 2003
	9	Western	Langara Island	Rowell *et al*. 2003
60	60	Western	Queen Charlotte	Rowell *et al*. 2003
20	20	Western	N. Vancouver and Scott Island	Rowell *et al*. 2003
7	7	Western	Triangle	Rowell *et al*. 2003
149	600	Western	Alaska coastal	Enderson *et al*. 1995
472	472	Western	Pacific	Green *et al*. 2006
367	367	Western	Rocky Mountain/Great Plains	Green *et al*. 2006
260	260	Western	Southwestern	Green *et al*. 2006
1,641	2,092	Western	Total	

Table 2. Productivity and annual number of young estimates for regional populations of North American peregrine falcons.

Number of young per nesting pair	Minimum number of pairs[a]	Maximum number of pairs	Minimum number of young fledged per year	Maximum number of young fledged per year	Place	Source for Productivity Information
				Northern Population		
1.18	1,000	1,000	1,180	1,180	Interior Alaska[a]	Green *et al*. 2006
1.13	225	225	254	254	Arctic Alaska	T. Swem, USFWS, personal communication
1.60	1,143	4,350	1,829	6,960	Canada	Rowell *et al*. 2003
1.80	450	2,000	810	3,600	Greenland	Falk and Møller 1987
1.45	2,818	7,575	4,073	11,994	Northen Total[b]	
				Eastern Population		
1.66	336	336	558	558	Eastern U.S.[c]	Green *et al*. 2006
1.60	22	22	35	35	Labrador and Newfoundland	Rowell *et al*. 2003
1.80	11	11	20	20	Bay of Fundy, Nova Scotia, New Brunswick	Rowell *et al*. 2003
1.60	28	28	45	45	S Quebec	Rowell *et al*. 2003
1.60	53	53	85	85	S. Ontario	Rowell *et al*. 2003
2.00	3	3	6	6	S. Manitoba	Rowell *et al*. 2003
1.65	453	453	749	749	Eastern Total	

Number of young per nesting pair	Minimum number of pairs[a]	Maximum number of pairs	Minimum number of young fledged per year	Maximum number of young fledged per year	Place	Source for Productivity Information
				Western Population		
1.70	4	4	7	7	S. Saskatchewan	Rowell *et al*. 2003
2.50	23	23	58	58	S. Alberta	Rowell *et al*. 2003
1.14	1	1	1	1	Interior British Columbia[d]	Rowell *et al*. 2003
1.14	11	11	13	13	Lower British Columbia, Victoria Island	Rowell *et al*. 2003
0.70	29	29	20	20	N. Alberta	Rowell *et al*. 2003
1.30	35	35	46	46	Yukon, Porcupine River	Rowell *et al*. 2003
0.60	22	22	13	13	Peel River, Yukon	Rowell *et al*. 2003
1.50	46	46	69	69	Yukon River	Rowell *et al*. 2003
1.14	46	46	52	52	S. Lake Yukon	Rowell *et al*. 2003
1.00	80	80	80	80	Mackenzie Valley, NWT	Rowell *et al*. 2003
1.30	9	9	12	12	Langara Island	Rowell *et al*. 2003
1.14	60	60	68	68	Queen Charlotte	Rowell *et al*. 2003
1.14	20	20	23	23	N. Vancouver and Scott Island	Rowell *et al*. 2003
1.14	7	7	8	8	Triangle	Rowell *et al*. 2003
1.14	149	600	170	684	Alaska coastal	Enderson *et al*. 1995
1.45	472	472	684	684	Pacific	Green *et al*. 2006
1.49	367	367	547	547	Rocky Mountain/Great Plains	Green *et al*. 2006
1.73	260	260	450	450	Southwestern	Green *et al*. 2006
1.14	1,641	2092	2321	2,835	Western Total	
1.36	4,912	10120	7143	15,127	POOLED GRAND TOTAL	

[a] 1.18, the more conservative estimate of productivity for the Interior Alaska regional population based on footnote 4 in Table 2, is used here.

[b] Number of Young per Nesting Pair in regional population and grand total summary rows is calculated as ($\sum$ Minimum Number of Young Fledged per Year) / ($\sum$ Minimum Number of Pairs). This approach was used because it provides the most conservative regional population estimate.

[c] Calculated from Table 1 in Green *et al*. 2006, combining data for the Midwestern/Northeastern and Southeastern regional populations (i.e., 171+21 young fledged divided by 95+21 sites checked = 1.66 young fledged per site).

[d] Italicized values in the Number of Young per Nesting Pair column are regional population means. Specific regional population estimates of productivity were not available.

records to estimate the fall and winter distribution of juvenile (less than 1 year old) peregrine falcons of known natal origin (*i.e.*, banded as nestlings) from these three populations.

Banding data were not ideal for this analysis because the distribution of banding effort was not uniform or stratified in a purposeful way, and re-encounters appeared biased toward fall raptor banding stations and areas of human habitation. Despite these biases, we believe banding records are useful, and offer the best available means for evaluating the possible environmental effects of this proposal. We used all available band recovery and re-encounter data in the U.S. Geological Survey files; this initially incorporated all encounter records from 1937 through 2004, including recoveries for birds banded in Canada. In addition, W.G. Mattox (Conservation Research Foundation [CRF], personal communication) provided us with all band recovery data for peregrines banded in conjunction with several projects by CRF and The Peregrine Fund in Greenland. We pooled these datasets, and then filtered the composite to select records for peregrine falcons that had been banded as nestlings and that were encountered in their first year. We further screened this dataset to eliminate individuals with questionable encounter dates (such as month unknown, recovered as skeletons) or questionable re-encounter locations (such as on ships at sea), and we filtered out all pre-migration and breeding season records (those records outside the months of September through March). Hereafter, we refer to this dataset as the peregrine band recovery dataset.

We inferred latitudinal and longitudinal patterns in the distribution of migrating and wintering peregrine falcons of each management population from cumulative frequency distributions of fall and winter band re-encounters. We treated these frequency distributions as probability distributions, which presume frequencies of band re-encounters are representative of the actual distribution of peregrines from each management population. Despite the aforementioned biases in banding data, we believe the results of these analyses are generally accurate, and offer the best insights possible with available data into how migrating peregrine falcons from each management population are distributed during fall migration. We excluded records of peregrines recaptured at raptor banding stations from distributional analyses because raptor banding stations were not evenly distributed, and including such recaptures heavily biased the probability distributions to latitudes and longitudes where active trapping was ongoing.

Migration distance increases with increasing natal latitude in North American peregrine falcons, as shown by regression analysis of distance between natal and winter re-encounter latitude – longitude coordinates in the peregrine band recovery dataset (Figure 2). In this dataset, natal latitude accounts for 59% of the variation in migration distance in North American peregrines[1]. Mean post-September re-

[1] This analysis probably underestimates the difference between management populations, because some Northern peregrines might not have reached their final winter destinations in November, and others might have begun the return northward migration before the end of March.

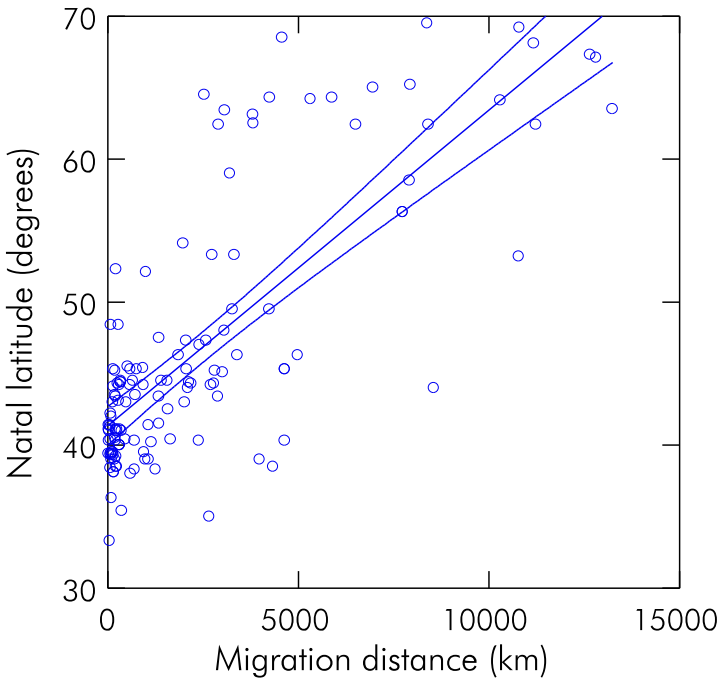

Figure 2. Linear regression analysis shows a strong positive linear relationship between natal site latitude and distance to wintering locale in North American peregrine falcons, based on 143 peregrine falcons that were banded in North America as nestlings and encountered during their first winter (1 November through 31 March). The regression line is bounded by the 90% confidence interval ($R^2 = 0.596$, slope = 0.002 [SE = 0.0001], $P < 0.001$).

encounter latitude differed among the three management populations as well (Figure 3); *post-hoc* analysis indicated mean post-September re-encounter latitude for Northern and Western populations and Western and Eastern populations were not different from each other, but means for Northern and Eastern populations were different (1-way analysis of variance, $F_{2,367} = 7.426$, $P = 0.001$, Bonferroni *post-hoc* analysis, $P < 0.001$ for Northern vs. Eastern, P = 0.162 for Western vs. Eastern, and $P = 1.00$ for Western vs. Northern).

Cumulative frequency distribution plots of winter re-encounters by latitude suggest that about 72% of Northern and 40% of Western peregrines migrate to locations south of 31° N latitude, while about 80% of Eastern peregrines winter north of this latitude (Figure 4). Longitudinal plots of fall and winter re-encounters suggest that very few Eastern peregrines occur west of 100° W longitude, about 65% of Western peregrines remain west of 100° W longitude, and about 88% of Northern peregrines range east of 100° W longitude (Figure 5). These patterns are apparent whether or not fall raptor banding station data are included.

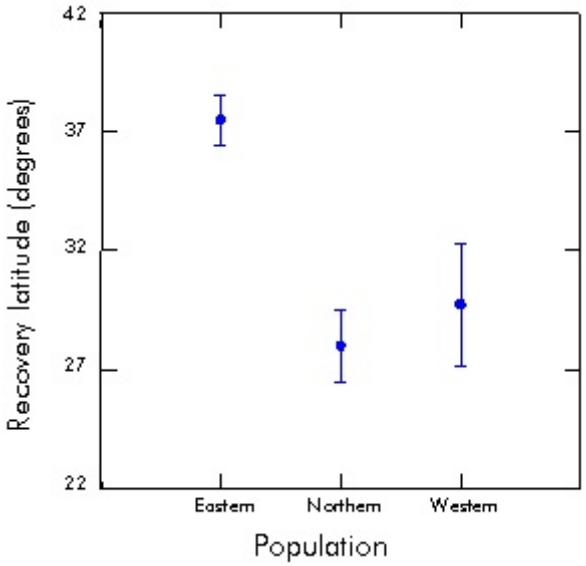

Figure 3. Mean (+1 SE) re-encounter latitude of first-year North American and Greenland peregrine falcons initially banded as nestlings and re-encountered during the period 1 September through 31 March, by management population. Peregrines captured at autumn raptor banding stations are omitted to avoid a bias toward trapping locales (Eastern n = 181, Northern n = 134, Western n = 55).

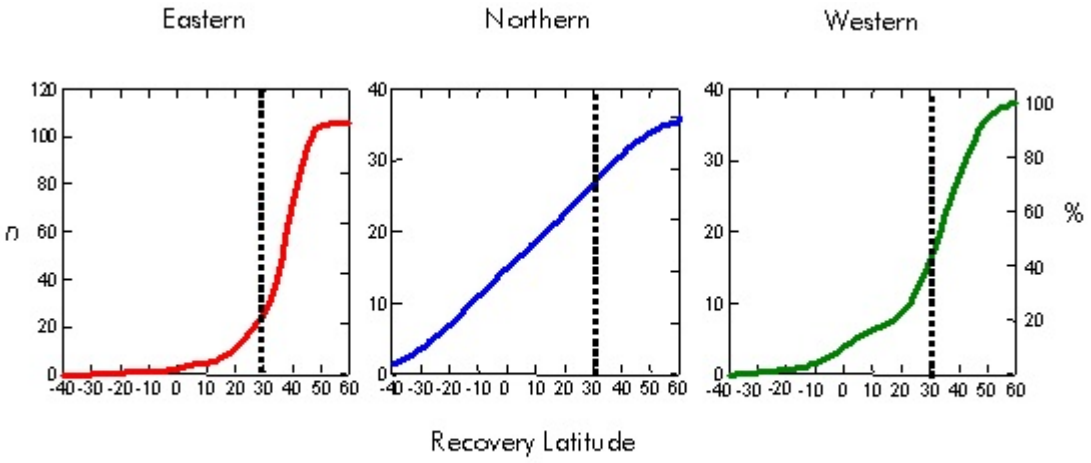

Figure 4. Cumulative kernel frequency distribution (tension[2] = 0.50) for band re-encounters by latitude for first-year North American and Greenland peregrine falcons initially banded as nestlings and re-encountered during their first winter (1 November through 31 March) by management population (Eastern n = 106, Northern n = 36, Western n = 38). The dashed lines represent the critical latitudes in the harvest alternatives.

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[2] The degree to which a line adheres to the points in an x-y plot. A tension of 0.50 is a "smoothed" line through the data.

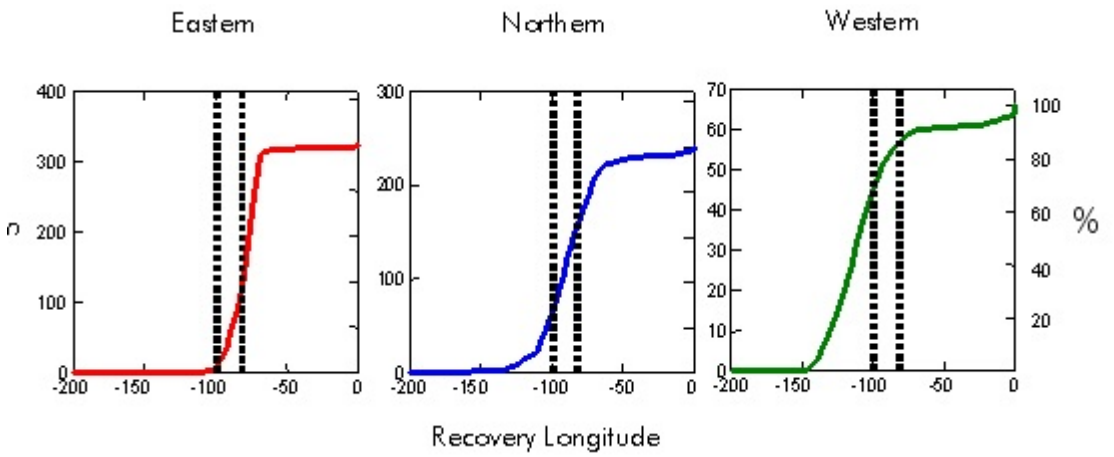

Figure 5. Cumulative kernel frequency distribution (tension = 0.50) for band re-encounters by degrees W longitude for first-year North American and Greenland peregrine falcons initially banded as nestlings and encountered during their first fall or first winter (1 September – 31 March) by management population (Eastern n = 323, Northern n = 240, Western n = 66). This distribution was not substantially skewed by including peregrines captured at fall raptor banding stations, so those recaptures were retained in the analysis. The dashed lines represent the critical longitudes in the harvest alternatives.

Taubert *et al*. (1999) identified timing as an important consideration in a harvest of migrant peregrine falcons, because focusing harvest at the time of peak migration of Northern peregrines increases the likelihood of encounters with individuals from this management population. To determine the timing of maximum passage of Northern peregrines in North America we used re-encounter records from fall raptor banding stations, which generally operate throughout the period of migration for North American raptors (Hawk Migration Association of North America 2007). We compiled a cumulative frequency distribution of re-encounters of Northern peregrines at banding stations (Figure 6). This analysis indicates that about 92% of re-encounters with Northern peregrines at banding stations occur between 20 September and 20 October.

HARVEST BIOLOGY

Millsap and Allen (2006) concluded that the maximum sustained yield (MSY) for a harvest of passage peregrine falcons from a healthy, non-migratory population was about 17% of the first-year cohort. Millsap and Allen based their analysis on data from a long-term mark-recapture study of a Western *F. p. anatum* population in Colorado, USA (Craig *et al*. 2004). Vital rates might differ for more northern, highly migratory peregrine populations, but no work of comparable detail has been published for *F. p. tundrius*. Court *et al*. (1989) observed slightly higher rates of adult survival (81% for females, 85% for males) among *F. p. tundrius* at Rankin Inlet, Northwest Territories, Canada, compared to that reported from Colorado (Craig *et al*.

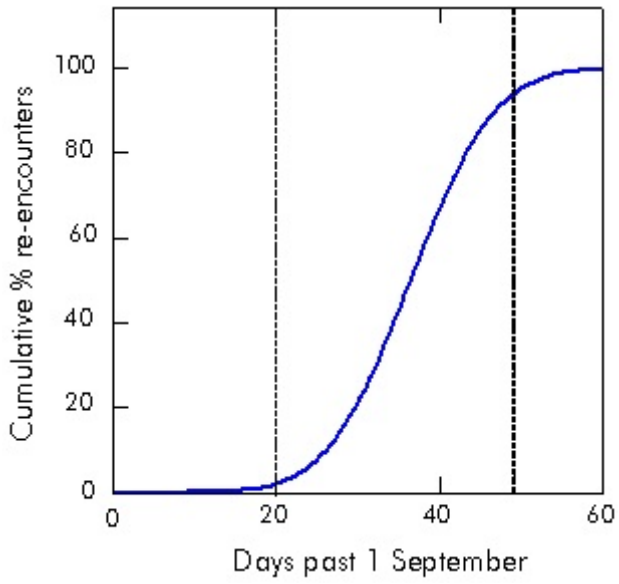

Figure 6. Cumulative frequency distribution (tension = 0.50) of re-encounters of Northern peregrines at fall raptor banding stations in the United States (n = 106). The dashed lines represent critical dates in the harvest alternatives.

2004), but they did not estimate subadult survival and their estimate of first-year survival did not account for emigration. Based on this limited information, we concluded there is no evidence to suggest survival rates of Northern peregrines would differ substantially from that for *F. p. anatum* in Colorado. However, data in Table 2 suggest productivity may be lower, at least currently, for Northern peregrines. We re-ran Millsap and Allen's (2006) model for a hypothetical Northern peregrine falcon population with the following vital rates: number of suitable nesting sites = 1,000; average annual adult survival = 81% (from Court *et al*. 1989); average annual subadult survival = 67% (unchanged from Craig *et al*. 2004); average annual first-year survival = 54% (unchanged from Craig *et al*. 2004); and annual fecundity = 1.45 young fledged per occupied nest site (from Table 2). We did not adjust this productivity estimate downward because post- banding/pre-fledging mortality was accounted for in the juvenile survival rate estimates in Craig *et al*. (2004).

The model suggested MSY under these vital rates occurred at a harvest rate of about 13% of fledged young (Figure 7). Millsap and Allen (2006) recommended that actual harvest rate not exceed 50% of calculated MSY or 5%, whichever is less, given uncertainties in the calculation of MSY, unaccounted-for stochasticity, and the inability to actually monitor the effects of harvest. Accordingly, following Millsap and Allen's (2006) recommendation, a maximum harvest rate of ≤5.0% is also indicated for Northern peregrines, given the estimated vital rates reported here.

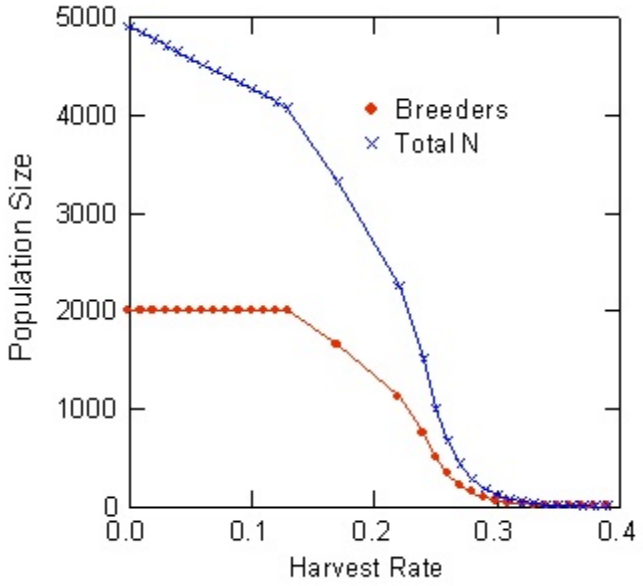

Figure 7. Estimated changes in population size at differing harvest rates for a hypothetical Northern peregrine falcon population with the following characteristics: number of suitable nesting sites = 1,000; average annual adult survival = 81%; average annual subadult survival = 67%; average annual first-year survival = 54%; and annual fecundity = 1.45 young fledged per occupied nest site. Nest site occupancy is assumed to equal 100% as long as sufficient breeders exist in the population to occupy all sites. Harvest rate is the proportion of the first-year cohort harvested by falconers, and is modeled as an incremental increase in first-year mortality. Based on approach described in Millsap and Allen (2006).

ALTERNATIVES

Considering our management objective and the population data presented in previous sections, our explicit management goal is to allow a harvest of up to 5% of minimum annual production of Northern peregrines, which is 183 migrants[3], while simultaneously (1) not increasing cumulative harvest of the U.S. portion of the Western or the Alaskan segment of the Northern population to a number greater than 83 for the Western segment and 65 for the Alaskan segment (based on data in Table 2, and consistent with the allocation framework presented in USFWS 2004); and (2) holding estimated take from non-target management populations to no more than 4 individuals from the Canadian portion of the Western population and 5 individuals from the Eastern population (*i.e.*, no more than 1% of annual production of non-target populations; see Table 2). The alternatives also assume a sex ratio no

[3] A total of 4,073 Northern fledglings per year × 0.9 (a 10% bias reduction in minimum number of young fledged) × 0.05 (from Millsap and Allen 2006) = 183.

greater than 60:40 in either direction, and a relatively evenly longitudinal distribution of harvest over the harvest area.

ALTERNATIVE 1

No action. Take by falconers of autumn migrant peregrine falcons would remain prohibited in the coterminous U.S.

ALTERNATIVE 2

Allow take of first-year migrant peregrine falcons between 20 September and 20 October from areas of the U.S. south of 31° N latitude and east of 85° W longitude, and within the state of Alaska.

ALTERNATIVE 3

Allow take of first-year migrant peregrine falcons between 20 September and 20 October from areas of the U.S. south of 31° N latitude and east of 100° W longitude and within the state of Alaska. This was essentially the 1999 recommendation of the AFWA, except we have expanded the temporal harvest window to include more of the migration period for Northern peregrines. This is the proposed action.

ALTERNATIVE 4

Allow take of first-year migrant peregrine falcons between 20 September and 20 October from areas of the U.S. west of 100° W longitude and from the state of Alaska.

ALTERNATIVE 5

Allow take of first-year migrant peregrine falcons between 20 September and 20 October from areas of the U.S. south of 31° N latitude and east of 100° W longitude, and from all areas of the U.S. west of 100° W longitude.

ALTERNATIVE 6

Allow take of first-year migrant peregrine falcons between 20 September and 20 October from anywhere in the U.S.

ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

We used estimates of minimum numbers of young fledged per year for each management population (from Table 2, but adjusted to account for the suspected ≤10% overestimate of production), and estimates of the proportional latitudinal and longitudinal distribution of migrants from each management population in Figs. 4 and 5, to infer the likely makeup of the harvest under each alternative (Table 3). We used the same approach to partition the expected harvest between the Canadian and U.S.

Table 3. Estimated make up of harvest by peregrine falcon management population under the harvest alternatives considered in this assessment. Proportions of management populations exposed geographically and temporally are from Figures 4 and 5, and population size estimates are from Table 2.

Management population	Estimated migrant population size[1]	Maximum allowable harvest rate	Maximum number allowed in harvest[2]	Proportion exposed latitudinally to migrant harvest	Proportion exposed longitudinally to migrant harvest	Expected number exposed to migrant harvest	Expected proportion of migrant harvest	Expected migrant harvest with constraints[3]	Number available for nestling harvest[4]
				Alternative 1					
Northern - Canada and Greenland[5]	2,375	5%	119	0.00	0.00	0	0.00		
Northern - Alaska	1,291	5%	65	1.00	1.00	65	0.439	65	65
Eastern	674	1%	7	0.00	0.00	0	0.00		
Western - Canada	422	1%	4	0.00	0.00	0	0.00		
Western - US	1,666	5%	83	1.00	1.00	83	0.561	83	83
Total	6,428		278			148		148	148
				Alternative 2					
Northern - Canada and Greenland[5]	2,375	5%	119	0.72	0.49	838	0.547	46	
Northern - Alaska	1,291	5%	65	0.72	0.49	455	0.297	25	40
Eastern	674	1%	7	0.21	0.86	122	0.079	7	
Western - Canada	422	1%	4	0.40	0.14	24	0.015	1	
Western - US	1,666	5%	83	0.40	0.14	93	0.061	5	78
Total	6,428		278			1,532		84	118
				Alternative 3					
Northern - Canada and Greenland[5]	2,375	5%	119	0.72	0.88	1,505	0.546	72	
Northern - Alaska	1,291	5%	65	0.72	0.88	818	0.297	39	26
Eastern	674	1%	7	0.21	0.99	140	0.051	7	
Western - Canada	422	1%	4	0.40	0.35	59	0.021	3	
Western - US	1,666	5%	83	0.40	0.35	233	0.085	11	72
Total	6,428		278			2,755		132	98

Management population	Estimated migrant population size[1]	Maximum allowable harvest rate	Maximum number allowed in harvest[2]	Proportion exposed latitudinally to migrant harvest	Proportion exposed longitudinally to migrant harvest	Expected number exposed to migrant harvest	Expected proportion of migrant harvest	Expected migrant harvest with constraints[3]	Number available for nestling harvest[4]
				0Alternative 4					
Northern - Canada and Greenland[5]	2375	5%	119	0.94	0.12	268	0.113	3	
Northern - Alaska	1,291	5%	65	0.94	0.12	146	0.062	2	63
Eastern	674	1%	7	0.98	0.01	7	0.003	0	
Western - Canada	422	1%	4	1.00	0.93	393	0.166	4	
Western - US	1,666	5%	83	1.00	0.93	1,549	0.656	16	67
Total	6,428		278			2,362		25	130
				Alternative 5					
Northern - Canada and Greenland[5]	2,375	5%	119	0.94	1.00	2,232	0.393	22	
Northern - Alaska	1,291	5%	65	0.94	1.00	1,213	0.214	12	53
Eastern	674	1%	7	0.21	1.00	141	0.025	1	
Western - Canada	422	1%	4	1.00	1.00	422	0.074	4	
Western - US	1,666	5%	83	1.00	1.00	1,666	0.294	16	67
Total	6,428		278			5,675		55	120
				Alternative 6					
Northern - Canada and Greenland[5]	2,375	5%	119	0.94	1.00	2,232	0.360	22	
Northern - Alaska	1,291	5%	65	0.94	1.00	1,213	0.196	12	53
Eastern	674	1%	7	0.98	1.00	660	0.107	7	
Western - Canada	422	1%	4	1.00	1.00	422	0.068	4	
Western - US	1,666	5%	83	1.00	1.00	1,666	0.269	16	67
Total	6,428		278			6,194		61	120

[1] Population size estimates are 90% of the minimum number of young fledged per year from Table 2 to compensate for possible biases in productivity estimates (see text).

[2] Maximum number allowed in harvest = (Estimated migrant population size × Maximum allowable harvest rate). Values are rounded down to the nearest whole number so harvest does not exceed the maximum allowable harvest rate.

[3] Expected number exposed to migrant harvest × expected proportion of migrant harvest.

[4] This figure updates the level of nestling harvest authorized by the USFWS for the Western management population from that published in USFWS (2006), using more recent population size and productivity values from Green *et al.* (2006).

[5] Combines Canadian and Greenland portions of Northern management population.

portions of the Western management population, and between the Alaskan and Canadian plus Greenland portions of the Northern management population. These latter political subdivisions were necessary to account for cumulative impacts on the Northern and Western management populations from the nestling peregrine harvest previously authorized (USFWS 2003), and to assess possible impacts to the Canadian portion of the Western management population, which is a concern of the Canadian Wildlife Service (CWS) (G. Holroyd, CWS, personal communication). We recognize that banding and population data are not optimal for these analyses, for reasons discussed previously. Nevertheless, they are the best information available to guide management decisions at the present time, and we believe they provide a sufficiently accurate picture of likely harvest makeup for management purposes.

For each alternative, we calculated the number of peregrine falcons that could be harvested without exceeding the harvest ceiling for each management population by dividing the maximum number allowed in the harvest by the expected proportion of migrant harvest for each population. We used this approach as a proxy for undertaking an actual physical count of the birds taken from each management population, which would require very burdensome reporting and identification requirements. The management population with the lowest number of peregrines that could be harvested was considered the limiting population, and the maximum harvest under that alternative was set as the overall harvest ceiling for the alternative. As an example, for Alternative 2, given the maximum allowable harvest and expected percent of migrant harvest by management population, the number of peregrine falcons that could be harvested without exceeding the harvest ceiling for the Northern - Canada and Greenland management population was 217 (118.75/0.547), the harvest ceiling for the Northern - Alaska management population was 217 (64.54/0.297), the ceiling for the Eastern management population was 84 (6.74/0.079), the ceiling for the Western Canadian management population was 273 (4.22/0.015), and the ceiling for the Western US management population was 1,367 (83.29/0.061) (rounding accounts for differences between reported harvest ceilings here and in Table 3 and numbers calculated directly from the equations here). Under this alternative, the maximum allowable harvest would be 84, the maximum number that could be taken without exceeding any of the ceilings for regional management populations (in this case, the ceiling for the Eastern management population).

One factor not explicitly accounted for is falconry harvest of migrant peregrines in Canada and Mexico. The best available data suggest no more than two migrant peregrines are taken by falconers in Canada annually, and about 25 have been taken historically each year by falconers in Mexico (G. Holroyd, CWS, personal communication; Ariel Rojo, Secretaría de Medio Ambiente y Recursos Naturales [SEMERNAT], personal communication). It is likely the Canadian, Mexican, and proposed U.S. harvest would all be from the same management populations, therefore the Canadian and Mexican harvest needs to be accounted for in the evaluation of cumulative impacts of the proposed U.S. harvest. We propose reducing

the maximum U.S. harvest under each alternative by 27 individuals to account for the international harvest.

ALTERNATIVE 1

Alternative 1 is consistent with the explicit management objectives. However, it would deny falconers outside Alaska access to peregrine falcons that could be removed from the wild for falconry without negatively affecting wild populations.

ALTERNATIVE 2

The maximum harvest that could be allowed under this alternative, given population-specific constraints outlined above, is 84, with a maximum U.S. harvest of 57. This alternative would result in predicted harvest levels consistent with the explicit management objective for most management populations, except that nestling peregrine harvest levels in Alaska and the western U.S. could not exceed 40 and 77, respectively, without leading to potential cumulative overharvest of these population segments. The population limiting harvest under this alternative is the Eastern management population. Allocation of harvest among age-classes (nestling vs. passage) and among states/provinces would need to be coordinated through the Flyway Councils.

ALTERNATIVE 3 (Proposed Action)

The maximum harvest that could be allowed under this alternative, given population-specific constraints outlined above, is 132, with a maximum U.S. harvest of 105. This alternative would result in predicted harvest levels consistent with the explicit management objective for most management populations, except that nestling peregrine harvest levels in Alaska and the western U.S. could not exceed 25 and 71, respectively, without leading to potential cumulative overharvest of these population segments. The population limiting harvest under this alternative is the Eastern management population. Allocation of harvest among age-classes and states/provinces would need to be coordinated through the Flyway Councils.

ALTERNATIVE 4

The maximum harvest that could be allowed under this alternative, given the population-specific constraints outlined above, is 25, which would allow no take in the U.S. This alternative would be consistent with the objectives for the management populations, but inasmuch as it allows no take in the U.S., it is not consistent with the AFWA request for consideration of take. The analyses of harvest under this alternative make it clear that harvest west of 100° W longitude greatly affects the possibility and level of take elsewhere in the U.S.

ALTERNATIVE 5

The maximum harvest that could be allowed under this alternative, given population-specific constraints outlined above, is 56, with a maximum take in the U.S.

of 29. This alternative would result in predicted harvest levels consistent with the explicit management objective for most management populations, except that nestling peregrine harvest levels in Alaska and the western U.S. could not exceed 53 and 66, respectively, without leading to potential cumulative overharvest of these population segments. The population limiting harvest under this alternative is the Canadian segment of the Western management population. Allocation of harvest among age-classes and states/provinces would need to be coordinated through the Flyway Councils.

ALTERNATIVE 6

The maximum harvest that could be allowed under this alternative, given population-specific constraints outlined above, is 61, with a maximum take in the U.S. of 34. The predicted harvest under this alternative would be consistent with the explicit management objective for most management populations, except that nestling peregrine harvest levels in Alaska and the western U.S. could not exceed 53 and 66, respectively, without leading to potential cumulative overharvest of these population segments. The allowed harvest would be lower under this alternative than under Alternative 3 because though the limiting factor under both alternatives is the Eastern population, Alternative 3 limits area in which take is allowed, thereby reducing the likelihood of take of Eastern peregrines. Allocation of harvest among age-classes and states/provinces would need to be coordinated through the Flyway Councils.

CUMULATIVE IMPACTS

Impacts of other forms of mortality and nesting failure (at contemporary levels) were accounted for in the demographic data used by Millsap and Allen (2006) and as modeled here. Impacts across management populations of each harvest alternative have been evaluated and reported above and in Table 3 using the best available biological data. We envision there may be some additional unintended mortality associated with capture of passage peregrines, but we suspect such mortality will be exceedingly low. Nevertheless, we will assess this issue each year as part of the adaptive management process for the proposed action (see below).

We believe our population estimates are buffered conservatively, and as such, compensate to some degree for unforeseen cumulative impacts. For example, under Alternative 2, we estimate that about 1,531 first-year fall-migrant peregrine falcons will be present in the harvest area during the harvest period. However, at a single location within the proposed harvest area (Curry Hammock State Park in the Florida Keys), an average of over 1,700 southbound migrant peregrines have been observed annually since 1999, and estimates suggest 39% (or 663) of these were likely first-year birds, and, based on trapping records, about 67% were females (Lott 2006). While many of the peregrines that pass through the harvest area likely pass Curry Hammock State Park, it is unlikely that over 40% do given the apparent bias in sex ratio, and it is

even less likely they are all sighted. We believe this is empirical evidence of the conservative nature of the assessment of take in this document.

ADAPTIVE MANAGEMENT

Given the considerable uncertainty in the banding and population data used in this assessment, validation of the assumptions employed is warranted. We will require collection of two breast feathers from all peregrines harvested during the first three years after implementation of the proposed action. At the end of three years, the feathers will be assessed using accepted techniques for stable isotope or DNA analysis to determine if the predicted latitudinal derivation of the harvest is being achieved, within reasonable limits given expected levels of measurement and sampling error. Should sufficient feathers be collected, these analyses may be used to test the origins of birds harvested under any alternative that allows take of migrant first-year birds.

One factor not explicitly accounted for is falconry harvest of migrant peregrines in Canada and Mexico. The best available data suggest no more than two migrant peregrines are taken by falconers in Canada annually, and about 25 have been taken historically each year by falconers in Mexico (G. Holyroyd, CWS, personal communication; Ariel Rojo, Secretaría de Medio Ambiente y Recursos Naturales [SEMERNAT], personal communication). It is likely the Canadian, Mexican, and proposed U.S. harvest would all be from the same management populations, therefore the Canadian and Mexican harvest needs to be accounted for in the evaluation of cumulative impacts of the proposed U.S. harvest. We propose reducing the maximum U.S. harvest under the selected alternative by 27 individuals to account for the international harvest.

We expect there to be extensive coordination through the Flyway Councils on matters of harvest allocation among participating states in the U.S. and Mexico, and Canadian provinces. We propose to work with the Flyway Councils to establish procedures for collection, housing, and assessment of feather samples. In addition, we propose to monitor the number, sex, and geographic distribution of peregrines that are harvested to ensure compliance with the frameworks in the proposed action. We will work through the Flyway Councils, or take regulatory actions, to resolve issues of non-compliance.

It is likely future population surveys will identify changes in population size and productivity values from those reported here. We will review population and harvest data for Canada, the U.S., and Mexico every five years, or at the request of the Flyway Councils, to reassess the allowable harvest limits. We will adjust the allowed take in the U.S. if take in Canada and Mexico change.

NATIONAL ENVIRONMENTAL POLICY ACT COMPLIANCE

We reviewed the proposed action to determine whether it met any of the general criteria for preparation of an Environmental Impact Statement (EIS). We concluded that, under the guidance in the USFWS Manual (550 FW3), allowing the harvest of first-year, fall-migrant peregrine falcons under the proposed alternative does not warrant preparation of an EIS. In particular, based on analyses of the effects of take using demographic data, we do not believe that a harvest of first-year, fall-migrant peregrine falcons should generate significant controversy, given the very minimal environmental effect. The proposed changes do not comprise a major federal action, therefore preparation of an EIS is not warranted.

TRANS-BOUNDARY EFFECTS OF THE ALTERNATIVES

Peregrine falcons are a highly migratory international resource. Stocks targeted for harvest in this DEA are produced at nest sites in the U.S., Canada, and Greenland, and spend the winter throughout the temperate U.S., Caribbean, Mexico, Central America, and South America. This DEA considers impacts on all of these source populations, and the preferred alternative is not likely to have measurable, negative effects on any of them. In addition, we have considered and accounted for the limited peregrine falcon harvest for falconry that does occur in Canada and Mexico (G. Holroyd, CWS, personal communication; Ariel Rojo, SEMERNAT, personal communication).

Most Canadian provinces are members of the Flyway Councils, and the CWS regularly participates in the Flyway Council meetings. SEMERNAT in Mexico has indicated an interest in expanding their participation in the Flyway Councils as well. Additionally, all three countries participate in the Trilateral Committee for Wildlife and Ecosystem Conservation (Trilateral), and issues of mutual concern regarding migratory birds are discussed there at the Migratory Bird Table. We believe the Flyway Councils and Trilateral afford ample opportunities for the countries of Canada, Mexico, and the U.S. to coordinate matters of concern regarding the harvest of migrant peregrines.

The Ministry of Environment and Nature in Greenland has expressed concern over take of first-year migrant peregrines for two reasons. First, the species "is a fully protected species in Greenland, and therefore all exploitation is prohibited." Second, the Ministry does "not support the capturing of wild animals with the purpose of keeping them in captivity" (Bjarne Peterson, Greenland Ministry of Environment and Nature, personal communication). We will continue to communicate with the Ministry of Environment and provide more details about the effects of this action on the peregrine population in Greenland.

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This assessment was prepared by Brian A. Millsap. Mr. Millsap has 29 years of experience in wildlife research and management, with an emphasis on raptor conservation.

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DIVISION OF MIGRATORY BIRD MANAGEMENT