PEREGRINE FALCON ASSESSMENT

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NATURAL HISTORY

Peregrine falcons are a rapid-flying bird of prey approximately the size of a crow: a wingspan of 36-44 inches, body length between 13 and 19 inches, and weights ranging from 20 to 32 ounces. Female falcons are generally 50% heavier than males. The sexes are similarly feathered. Adults have slate gray feathering on the back contrasting a white or buffy underbody with dark, transverse barring. Immature peregrines are brownish above and sandy-colored underneath, vertically streaked with dark brown. A broad "moustache-like" area of dark feathering on the sides of the head is highly distinctive.

In flight, peregrine falcons are recognizable by their highly tapered wings, long narrow tails, and rapid wingbeats interspersed with glides on extended wings. Falcons generally capture birds in flight with breathtaking dives ("stoops" of up to 180 miles per hour) from loftier hunting positions. Peregrine foods include a diversity of avian prey ranging in size from small passerines (e.g., warblers) to mid-sized waterfowl such as a mallard. Pigeons, jays, robins, and similar-sized birds are foremost in their diet in terrestrial, inland habitats while shorebirds and smaller seabirds (e.g., terns) are common peregrine foods in coastal areas (Bent 1938).

Peregrines typically nest in remote cliff settings but are occasionally attracted to tall buildings as the urban counterpart in metropolitan areas. Nests are usually simple scrapes in the soil, gravel or grassy substrates situated on open ledges, overhangs or other recesses in the cliff face. Tree-nesting is quite rare (one instance reported in Maine) and mostly limited to nesting in hollows and broken tops of overmature trees

(Snow 1972) or occupying nests built by other raptors (Barclay and Cade 1983). Eyries are usually adjacent to an open area (fields or more frequently wetlands) to accommodate their foraging habits.

In Maine, breeding peregrines establish territories in March (Palmer 1949). A clutch of 3 or 4 eggs (infrequently more) is laid at 1-2 day intervals by the end of March or early April. The incubation period has been reported as 30-36 days. Young falcons hatch in May and remain in the nest for approximately 6 weeks (Sherrod 1982) before fledging (making first flights) in June. Fledglings have been seen at Maine eyries through July. Fall migration peaks during the last half of September and early October. Sightings of peregrines in Maine are infrequent from December through February.

HISTORY

Habitat Trends

The physical qualities of peregrine falcon habitat in Maine have not changed appreciably over time. Increasing human populations and land uses did not likely affect the quality of remote and inaccessible cliff settings favored as eyries other than increasing back-country recreation in the latter half of the 20th century. At the same time, some peregrines exhibited their adaptability by occasionally nesting on buildings and other man-made structures in major metropolitan areas of the Northeast.

Food resources may have decreased from pristine levels, but there are several indications of greater food abundance since 1900 (e.g., increases of colonial nesting seabirds, pigeons in urban areas, etc.). Accessibility to potential foods, dependent upon open settings near eyries, may have initially improved in the interior with land clearing for agriculture in the 1800's but has undoubtedly diminished with a steady reversion to forests in this century (Powell and Dickson 1984). While the quantity of food resources has not been a key variable, an artificial degradation of food quality (i.e., environmental contamination) was likely foremost in the demise of peregrine falcon populations.

Widespread use of persistent organochlorine pesticides (most notably DDT and its by-products) left residues throughout the environment and foods of the falcons. The loss of eastern falcon populations by the mid-1960's has been attributed mostly to DDT-impaired reproduction in peregrines (Peakall 1976). Residual levels of DDT

contamination have since declined significantly in potential peregrine foods sampled in eastern North America (Johnston 1974, Peakall 1976).

Population Trends

Peregrine falcons were characterized as a rare breeding resident of Maine throughout the first-half of the 20th century. Conjectures of past population size ranging from 10 to 15 nesting pairs statewide suggest that their abundance has been historically limited (Knight 1908, Palmer 1949). Locations of historic nest sites (Table 1, Figure 1) suggest a primary traditional breeding range in the western mountains (WMU 3 and 4), the northern interior (WMU 2), and along the eastern coast (WMU 6).

A 1939-40 inventory of peregrine falcon eyries in the eastern United States identified 275 nesting pairs (Hickey 1942). Population declines of approximately 10% were implied during this first assessment. Severe reductions in the numbers of peregrines were subsequently reported in the 1950's. A resurvey of these traditional nest sites in the East during 1964 failed to document any successful nestings of peregrine falcons (Berger et al. 1969). A third assessment of historical eyries did not reveal th6 presence of any breeding peregrines in the eastern United States (Fyfe et al. 1976).

A report of the 1940 peregrine inventory in Maine (Hickey 1942) did not specify the status of 10 traditional eyries but questioned the validity of previous breeding reports near Milltown, Bangor, and Auburn (Bent 1938). The results of the 1964 survey in Maine were stated as "of 10 valid, or probably valid sites, one was active as recently as 1962, another until 1960 or 1961, and a third until 195511 (Berger et al. 1969). An

Table 1. Historical peregrine falcon eyries in Maine.

Wildlife Management Unit	Township	Site	Year	Reference
2	Kineo Twp.	Mt. Kineo	1940's	(Woodward 1948)
	Mt. Katahdin Twp.	North Basin	1940's	(Taber 1950)
	T3 R12 WELS	Ripogenus Lake	1930's	(Spofford 1975)
	T15 R9 WELS	Deboullie Mtn.	1920's	(Potter unpubl.)
3	Andover West Surplus	Lightning Ledges	1880's	(Brewster 1924)
4	Bethel	Pine Mtn.	?	(Spofford 1975)
	Peru	Tumbledown Dick Mtn.	1950's	(Spofford 1975)
	Woodstock	Bald Mtn.	1920's	(Spofford 1975)
5	Clifton	Eagle Bluff	1940's	(Spofford 1975)
6	Addison	Tumbledown Dick Head	1930's	(Thompson unpubl.)
	Bar Harbor	Champlain Mtn.	1950's-1960's	(Favour unpubl.)
	Jonesport	The Brothers	1900's	(Palmer 1949)
	Mount Desert	St. Sauver Mtn.	1950's	(Favour unpubl.)
	Southwest Harbor	Beech Mtn.	1950's	(Spofford 1975)

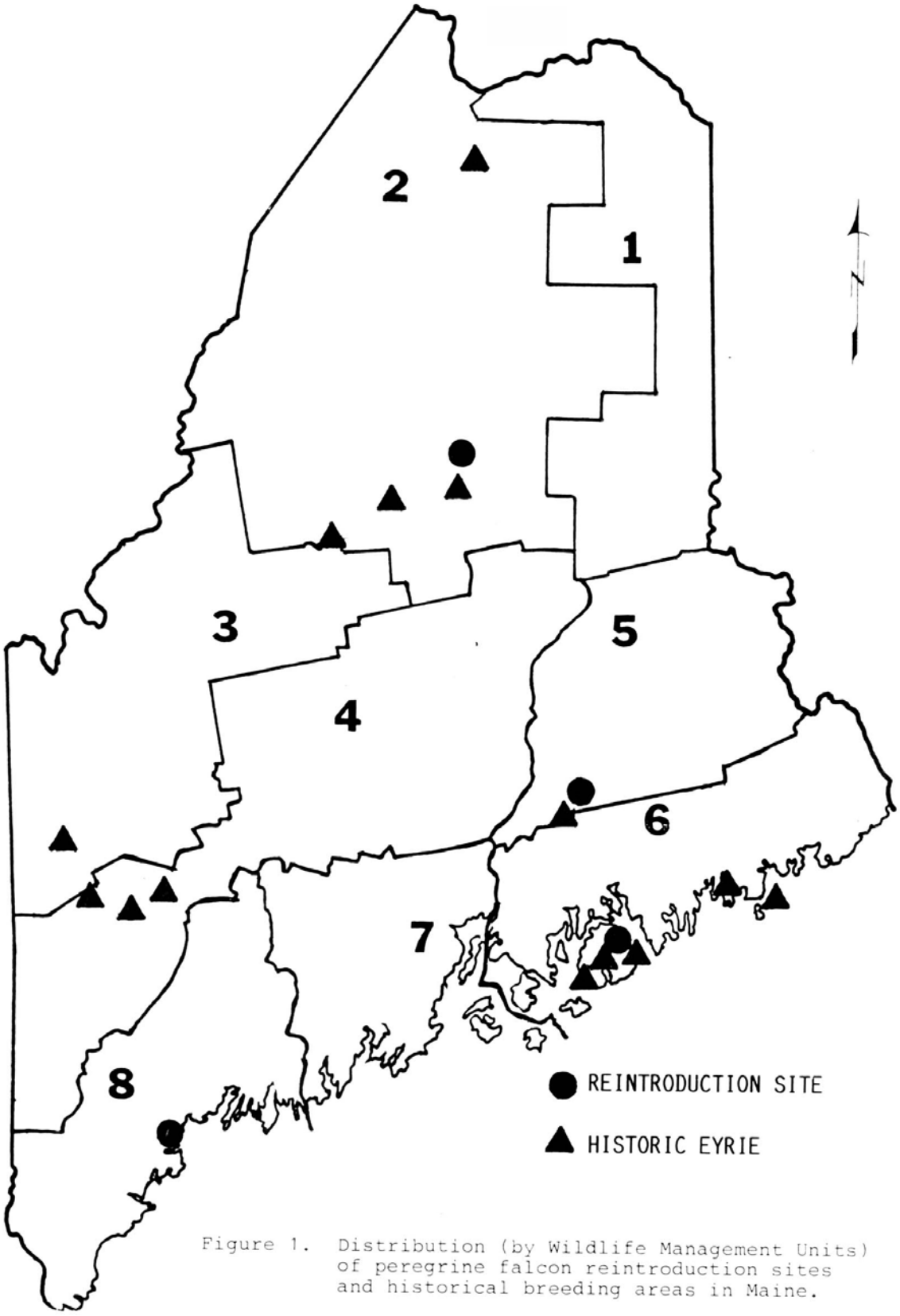

Figure 1. Distribution (by Wildlife Management Units) of peregrine falcon reintroduction sites and historical breeding areas in Maine.

eyrie occupied by peregrines in Acadia National Park (WMU 6) during 1962 was the last known active nest in the eastern United States prior to apparent extirpation of the species as a resident breeder by 1964. Spofford (1975) checked 13 historic eyries in Maine during 1975 and recorded a total absence of resident peregrines.

Virtually all of the factors which led to the demise of eastern peregrine falcon populations are direct human influences: shooting, egg-collecting , human disturbances near eyries, loss of nesting habitat , and environmental contamination (particularly that caused by organochlcrine compounds such as the insecticide DDT). Persistent contaminants such as DDT reached peregrines through their foods. Their sublethal, chronic effect (unnoticed for years) was to alter calcium deposition during eggshell formation in the female which resulted in shell thinning, egg breakage, and reproductive failure among peregrines and other birds of prey (Peakall 1976). Shooting peregrines and collection of their eggs were documented in Maine during the early 1900's (Palmer 1949).

Use and Demand Trends

Consumptive uses of peregrines such as egg-collecting, shooting, and taking of young for falconry ceased with extirpation of eastern populations. Perhaps more prevalent elsewhere than in Maine, at least 69 of 275 traditional peregrine nests in the eastern United Status were egged at least once during the 1900's. Nestlings were taken from as many as 36 eyries by falconers or would-be practicioners (Berger et al. 1969).

A new, non-consumptive use and desire for peregrine falcons has steadily developed over the past 2 decades. Concern for environmental issues and wildlife resources has instilled new interest and appreciation for sensitive species such as the peregrine. Their classification as an endangered species and subsequent development of nongame wildlife programs which prioritize conservation of endangered species solidified these resource values.

Regulation

Peregrine falcons are protected by two federal legislations: the amended Migratory Bird Treaty Act of 1972 and the Endangered Species Act of 1973. Harm or possession of peregrines is prohibited. Comparable state protection resulted from enactment of the Maine Endangered Species Act in 1975.

A strong mode of habitat protection is effective during reviews of activities dependent upon federal funding or permits through Section 7 of the federal Endangered Species Act:

> "Section 7. The Secretary shall review other programs administered by him and utilize such programs in furtherance of the purposes of this Act. All other Federal departments and agencies shall, in consultation with and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered sppcies and threatened species listed pursuant to section 4 of this Act and by taking such action necessary to insure that actions authorized, funded, or carried out by them do not jeopardize the continuedexistence of such endangered specie, and threatened species or result in the destruction or modification of habitat f such species which is determined by the Secretary, after consultation as appropriate with the affected States, to be critical."

Crucial indirect habitat protection also evolved with the passage of the Federal Pesticides Control Act which led to restricting use of organochlorine compounds such as DDT in the United States.

Management Strategies

Following classification of peregrine falcons as an endangered species in 1973, the Eastern Peregrine Falcon Recovery Team was formed to assess problems, status, appropriate management., and recovery goals. The Eastern Recovery Plan (Bollengier et al. 1979) emphasizes introductions of captive-produced falcons with an eventual restoration goal for a self-maintaining population of at least 175 nesting pairs, 50% of the estimated pre-DDT era numbers of peregrine pairs breeding in the eastern United States.

Large-scale, captive breeding of peregrine falcons for eastern reintroductions was initiated in the early 1970's under the auspices of the Peregrine Fund (a nonprofit organization headquartered at the Cornell University Laboratory of Ornithology) (Cade and Fyfe 1978). Reintroduction techniques are a variant of the traditional falconry practice of hacking. Procedures, thoroughly outlined by Sherrod et al. (1982), essentially involve placing broods of captive-produced fledglings in a protective enclosure where they can be fed without imprinting on their human caretakers and orient themselves in an appropriate habitat setting for peregrines upon their release. Food is provided until the birds become self-sufficient and disperse from the release site (approximately 5-6 weeks).

Preparations for hacking peregrines in Maine were conducted in 1983 with assessments of historic eyries and non-traditional habitats for their suitability as release sites (Snyder and Owen 1983a). Maine's reintroduction of peregrines was initiated in 1984 and expanded the year following. A total of 19 captive-reared falcons were released at 3 hack sites in the first year: Horse Mountain in T6 RB (WMU 2), Fletcher Bluff in Amherst (WMU 5), and Jordan Cliffs in Mount Desert (WMU 6) (Hutchinson and Bowman 1984). Twenty-eight were hacked at 4 locations in 1985 with the addition of a release site on the Key Bank in Portland (WMU 8) (Figure 1, Hutchinson and Chipman 1985). Releases thus far have been 100% successful with all 47 peregrines surviving to the period of dispersal.

Past Management Goal

The initial species assessments and management recommendations for peregrine falcons were recently developed (Snyder and Owen 1983b).

1983

Management Goal: Restore a self-sustaining peregrine falcon population in Maine.

Management Objective: Re-establish a breeding peregrine population of 10-15 pairs through annual reintroductions of captive-reared falcons.

HABITAT ASSESSMENT

Status

Suitable habitat is not limiting to the reestablishment of a peregrine falcon population in Maine. Variable nesting substrates are utilized in their cosmopolitan range, but peregrines often select cliff settings. While prevalent in the mountainous landscape of western Maine and locally present along the eastern coastline, the availability of cliffs is certainly finite elsewhere in the State. Increased recreational uses (e.g. hiking and rock climbing) of some cliff sites may have reduced the overall suitability of several historic peregrine eyries in Maine (Snyder and Owen 1983b). Seasonally diminished human activity during the most critical period of the nesting cycle (mid-March through June) may enable pairs to reside at sites with increased recreation later in the year.

Many traditional nest sites in the State still offer relatively undisturbed cliffs adjacent to forest openings. Eyries in Maine were often in close proximity to ponds, or other open wetland expanses (Palmer 1949). Numerous wetlands are widely available Throughout the State. Occasional nest associations with terrestrial openings such as agricultural fields are more limiting than in the past, but expansive commercial timber harvests (especially clearcuts) may provide temporary open settings required by foraging peregrines.

It has become increasingly difficult to generalize on the sensitivity of peregrines to potential human disturbances. Nesting by reintroduced falcons on buildings and bridges in some eastern cites indicates the degree atypical opportunities available.

Urban settings are thus viable potential habitat offering both nesting substrates and rich food resources (e.g., starlings and pigeons). For instance, the city of Portland is a prime, non-traditional locale especially with enhanced foraging opportunities afforded by its proximity to the coast.

Marine and estuarine habitats from Portland to Lubec offer rich food resources and ideal foraging opportunities for peregrines. Rocky ledges exist as possible nest sites along most of Maine's coastline, although preferable situations with marked vertical relief are in limited supply. Occasional nesting in trees or on the ground (if some isolation exists) greatly expands the quantity of available nest substrates but is somewhat unlikely in most areas. The high success of nesting towers constructed for peregrines in mid-Atlantic coastal states reflects an opportunity for artificial enhancements (Barclav and Gilroy 1985). Marshes, tidal flats, and open waters in costal Maine support a diversity of abundant foods for peregrines. Offshore islands are an important stopover for migratory peregrines originating from tundra-nesting populations to the north (Podolsky 1986).

Changes

No significant changes are discernible in the quantity or quality of potential habitat for peregrine falcons in Maine.

Projections

The availability of suitable habitat will not be a factor restricting peregrine falcons during the current 5-year planning period or the foreseeable future beyond. Past

extirpation of the species as a breeding resident and subsequent reductions in detrimental organochlorine residues provide a net balance of rich resources for peregrine re-establishment and recovery.

POPULATION ASSESSMENT

The lack of a habitat suitability index for peregrine falcons precludes any quantified judgments of current carrying capacity for the species in Maine. This determination requires a more complete understanding of the apparent low nesting numbers historically in the State as well as insights into the diverse habitat circumstances where reintroduced peregrines have been established as breeders in the eastern United States. Their extirpated status and current existence dependent upon continued reintroduction minimize the current need to assess population limits for Maine's available habitat.

Status

A pair of peregrine falcons nested in Acadia National Park (WMU 6) in 1980 and successfully fledged 2 young. Their origin was undetermined (Townsend unpubl., Barclay and Cade 1983). The site was unoccupied during 1981-85. This is the only nesting record of peregrines in Maine since their extirpation as a breeding resident in the early 1960's.

Reintroduction of peregrine falcons in Maine from captive-breeding projects was initiated in 1984. Releases of 19 captive-produced young that year and twenty-eight in 1985 represent the initial efforts to re-establish resident peregrine falcons in the State. One subadult male returned to the Horse Mountain release location (WMU 2) in 1985. A single sighting of a peregrine was also recorded that year at the Fletcher Bluff hacking site (WMU 5). These 47 reintroduced birds or immigration from hacking projects

elsewhere in eastern North America are the only existing, viable future of a peregrine falcon population in Maine.

Changes

There has been no net change in the extirpated breeding status of peregrine falcons in the State. An isolated successful nesting in 1980 at least confirmed the capability of Maine habitats to support nesting peregrines. This single success, without directive aid from release of captive-produced falcons in Maine at that time, actually infers the high suitability of potential habitats and strong potential for re-establishing peregrines in the State.

Proiections

Returning peregrines from 1984 and 1985 releases will be potential breeders in 1986 and 1987, respectively. Continuation of the reintroduction program in Maine at present rates of hacking captive-reared peregrines should result in the re-establishment of several breeding pairs by 1990. Continuity and saturation of releases (temporally and spatially) would maximize the probability for achieving the preliminary state goal of 10 nesting pairs in Maine and twenty in the "northern/boreal" region (updated Eastern Peregrine Falcon Recovery Plan). Regional coordination of reintroduction projects is essential to the goal of stabilizing peregrine falcons throughout the Northeast (Figure 2).

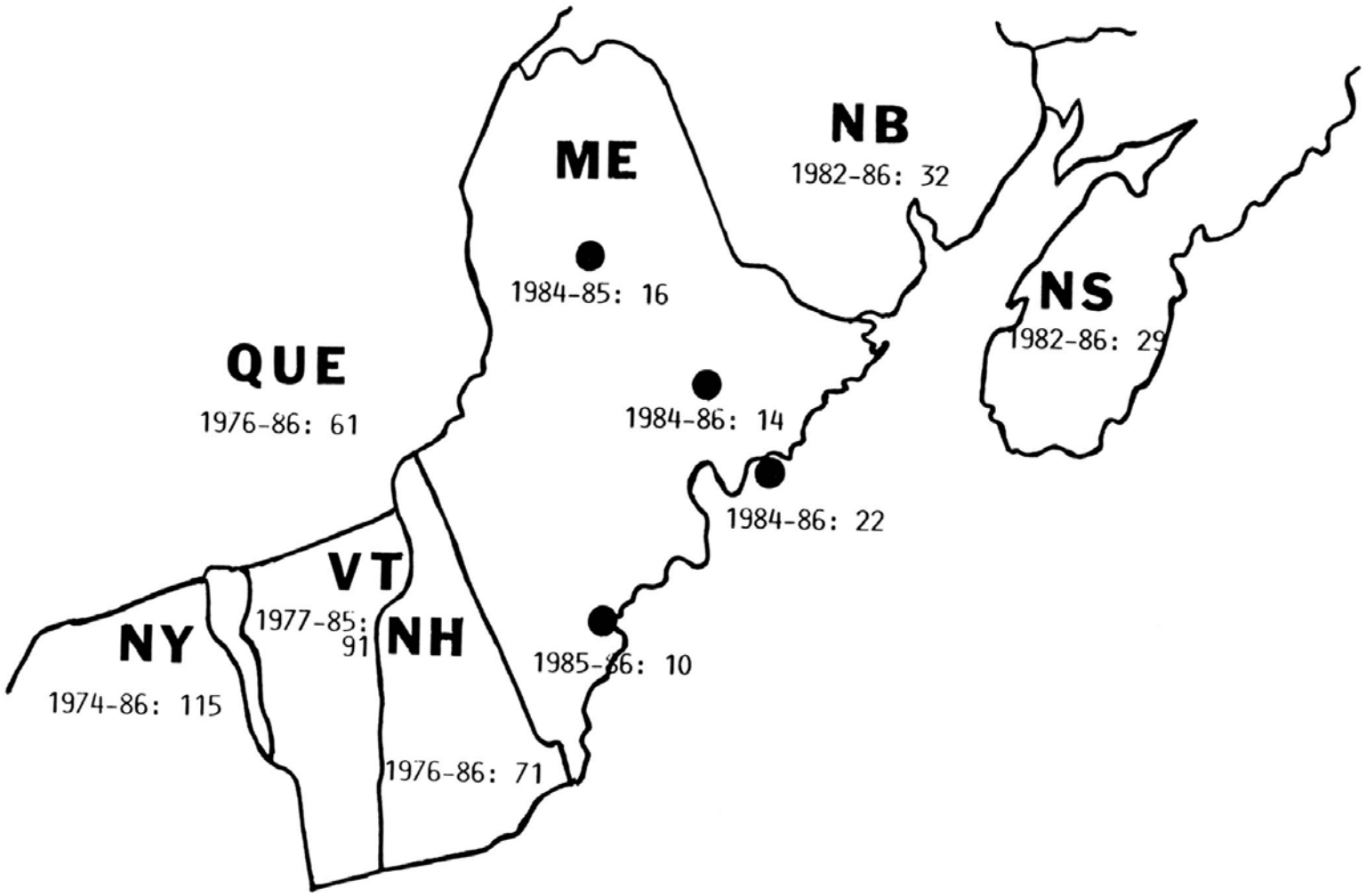

Figure 2. Successful reintroductions of peregrine falcons in the “Northern Region”, 1974-86.

Population Characteristics

Except for a single nesting in 1980 (2 young fledged) there are no recent data to assess natality, mortality, or recruitment of peregrines in Maine. Population parameters derived elsewhere for the species provide some guidance of expected trends among any re-established breeders and the appropriate scale of reintroduction efforts.

Natality. Sixty-three nesting attempts have been documented through 1985 among peregrines reintroduced in the eastern United States (Barclay and Gilroy 1985). Forty-seven nestings resulted in the eventual fledging of 128 young: a nesting success rate of 75%, average brood size of 2.7 young per successful pair, and an overall productivity of 2.0 young per nesting attempt.

Mortality. Available estimates of first-year mortality include a 26% loss of hacked young peregrines (from release to dispersal, Barclay and Cade 1983) and 55% mortality (post-dispersal, Shor 1970) combining for an overall 67% death rate between release of reintroduced peregrines and their first birthday. Mortality of subadults (second year) and older adult peregrines is estimated to be 20% annually (Mebs 1960).

Growth. Assuming recruitment at 2 years of age, a peregrine falcon population with the preceeding levels of natality and mortality could increase by 8% annually. The obvious dilemna is attainment of a minimal viable population size not vulnerable to extinction from random events as well as the necessity of establishing this population through reintroduction programs. Appropriate levels of restorative management have been projected as hacking of 2-8 captive-reared peregrines for every returning subadult or adult peregrine (Barclay 1980).

USE AND DEMAND ASSESSMENT

Status

The non-consumptive use of peregrine falcons is essentially the opportunity to view them in Maine. Appreciation of these opportunities varies widely among individuals. The spectacular flights of peregrine falcons are invariably enjoyed regardless of prevailing attitudes or familiarity with the species. Positive attitudes and support for restoration efforts are generally implied by a widespread concern to know that a rare resource is being managed. Public interest and participation in bird watching, nature photography, outdoor recreation, environmental issues, and natural resources conservation are all causes for enjoyment of peregrine falcons as a special element of Maine's wildlife heritage.

Past extirpation of breeding peregrine falcons from the State has caused almost non-existent levels of use opportunity. High level interest and demand are typically amplified further by such rarity and endangered species status. Recent opportunities for enjoyment are concentrated in coastal Maine where tundra peregrine falcons can be regularly seen during fall migration (Baird 1984).

Changes

Releases of 47 captive-produced peregrines in 1984-85 have provided localized opportunities to view and enjoy wild falcons in Maine. Remote release sites obviously minimize human encounters as a necessary precaution for young falcons to attain their independence. Hacking of peregrines in the city of Portland in 1985 represents the

other extreme of high visibility and resource enjoyment in Maine's largest urban area. These special circumstances undoubtedly promote greater resource appreciation and demand.

Projections

Very high levels of public awareness and an increasing demand for viewing opportunities are anticipated throughout recovery efforts directed toward this endangered species. Continuation of public education efforts should minimize occasional use conflicts (e.g., rock climbing and hiking near release sites or eyries, competing resource concerns such as influences on terns or other important seabird nesting colonies, and general misunderstanding of predatory roles).

SUMMARY AND CONCLUSIONS

Dramatic declines of peregrine falcons during the 1950's stemmed primarily from the effects of the pesticide DDT on their reproduction. By the early 1960's, the entire population of peregrine falcons in the eastern United States was lost. Recovery efforts are therefore dependent upon the reintroduction of falcons from captive-breeding projects. Peregrines have been a federally listed endangered species since 1973. Reintroductions were initiated in the East in 1975 and in Maine during 1984. Habitat is not limiting for the re-establishment of a resident peregrine population in Maine. Public interest and appreciation for this rare resource have soared with a hindsight perspective on the plight of this species, once extirpated in Maine and throughout the East.

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PEREGRINE FALCON MANAGEMENT GOALS AND OBJECTIVES

1985-1990

GOAL: Restore a self-sustaining peregrine falcon population in Maine.

Population Objective: Re-establish a minimum breeding population of 6-10 pairs of peregrine falcons by 1990.

Capability of Habitat: This preliminary abundance objective is well below carrying capacity. Suitable habitat is not limiting to restoration efforts. Past extirpation of peregrines has left a balance of a resource-rich environment.

Feasibility: Re-establishment of breeding peregrines is a proven success in the eastern recovery program. The scale and continuity of reintroduction efforts have a foremost influence on attainment of the population objective. This level of restoration requires annual releases of 20-30 fledgling falcons through at least 1989. The program is highly dependent upon the success and financial support of large-scale captive breeding efforts administered by The Peregrine Fund.

Desirability: There is widespread public interest and support for restoration of breeding peregrines as a unique element of Maine's wildlife heritage. The desirability of such management is especially heightened by the connotation of correcting the past, human-induced extirpation of peregrines.

Possible Consequences: The predatory nature of peregrine falcons will not always be favorably accepted, particularly when there is limited public understanding of this ecological role. These concerns will likely be infrequent and minor in nature, perhaps most debated in the event of losses among other special-interest species (e.g., certain coastal seabirds).

Summary of Working Group Concerns

PEREGRINE FALCON

Populations

1. Goal and objectives as well as criteria for delisting needs to be established before major recovery work is undertaken.

2. Maine's "Goals and objectives" must be reconciled with the overall recovery plan. Evaluation should be done on a regional basis.

3. Concern was expressed that while Maine contains a major component of available habitat, we are not represented on the Federal Recovery Plan.

4. Not enough emphasis being placed on western Maine introduction.

Use

1. Measurements of non-consumptive use should not be limited to actual observation but should also include the satisfaction that comes from knowing that the birds are alive And well.

2. Back-country recreation may affect the quality of the sites.

Habitat

1. Amount of habitat is unknown. Current estimate is only a minimum.

2. Concern that the habitat inventory has been too specific and should include other cliff nesters, particularly golden eagles.

Funding

1. Concern that the federal funding for reintroduction may be in jeopardy.

Peregrine Falcon Problems and Strategies in Order of Priority

Problem 1: Past extirpation of peregrine falcons in the eastern United States has necessitated active reintroduction programs to achieve population objectives and goals.

Strategy 1: Continue or expand the scale of reintroduction efforts until a preliminary release goal of 150 peregrines is achieved.

Strategy 2: An interim assessment of program accomplishments, availability Of falcons for release, and funding levels will be made to guide program continuity.

Strategy 3: Reintroductions shall be jointly coordinated with cooperating organizations and emphasize regional recovery goal priorities.

Strategy 4: Selection of reintroduction sites will foremost promote the short-term safety of released peregrines and be guided by annual assessments of suitability.

Strategy 5: ReintrodUctions will secondarily be designed to promote regional saturation of released peregrines in successive years with minimum separations of 25 miles between hacking locations-

Strategy 6: Refined, standardized "hacking" procedures will be employed to promote attainment of independence among peregrines 5-6 weeks after release.

Problem 2: Reintroduction programs and subsequent resource management require active, annual inventories for nesting peregrines.

Strategy 1: Spring visitations by staff and a network of cooperators will monitor territorial behavior of peregrines at potential breeding areas.

Strategy 2: Inventories will emphasize historic eyries, reintroduction locations, and potential alternate nest sites within a minimum 5 mile radius.

Strategy 3: Surveys of other potential habitats W'll be integrated with parallel methods of golden eagle inventories.

Strategy 4: occupied peregrine eyries will be periodically monitored to assess nesting activity, success, and production.

Strategy 5: Population assessments and management will be supported with additional research including banding, habitat use observations, monitoring conflicting resource uses, etc.

Strategy 6: Conservation of peregrine breeding areas will be sought via general education efforts and cooperative agreements with landowners.

Strategy 7: The potential for artificial nesting substrates to guide the distribution and aid the monitoring of peregrine breeding locations will be examined, emphasizing areas of locally limited nesting opportunities.