



MANAGEMENT AND BIOLOGY

OF THE

PEREGRINE FALCON

(Falco peregrinus)

IN PENNSYLVANIA

TEN YEAR PLAN

(2013 – 2022)

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EXECUTIVE SUMMARY

The peregrine falcon (*Falco peregrinus*) was federally Endangered, but with population improvements, was removed from the federal Endangered Species list in 1999. It remains on the Pennsylvania Endangered list until population goals can be met. Following a dramatic decline as the result of environmental contaminants and a similarly dramatic recovery, the peregrine falcon serves as a modern symbol of restoration and hope. Two peregrine falcon populations occurred historically in Pennsylvania: the arctic subspecies (*F.p.tundrius*), which migrates through the state in low numbers in spring and fall; and a nesting subspecies (*F.p.anatum*). The breeding population in Pennsylvania numbered as many as 44 pairs in the early decades of the 20th century before completely disappearing from the eastern United States. The decline of the species here, and worldwide, is largely attributed to organochloride pesticide contamination. The Peregrine Fund Inc. pioneered the reintroduction of this federally Endangered species into the eastern United States. They used three reintroduction locations in Pennsylvania during the 1970s and 1980s, and the Pennsylvania Game Commission released birds at four locations in the state during the 1990s. By 2003, the eastern population had grown to approximately 336 nesting pairs, and by 2012 at least 32 nests were known in Pennsylvania. Pennsylvania's recovery objective is a secure, self-sustaining population. Legal delisting requires that several conditions be met for at least 3 consecutive years; (1) 22 or half the historic number of nests are occupied (calculated as the number of cliff-nesting pairs plus 25% of the pairs on man-made structures; (2) at least half of the pairs fledge young, and (3) 1.5 or more fledglings are produced per occupied nest. Nesting pairs should be monitored closely to evaluate nesting success and young should be banded, where possible, to track the population as long as they are listed as Endangered. Historic nest sites should be regularly checked to identify new nesting pairs. Management activities are identified to improve nesting success, including placement of improved nesting structures at nest sites, medicinal treatment of young, and reduction of disturbance at nest sites. Other goals, objectives, and strategies follow.

MISSION STATEMENT: To recover and protect a self-sustaining peregrine falcon population in Pennsylvania, that will restore the species' ecological role and enable the general public to enjoy observing this majestic bird.

GOAL 1. Initiate legal delisting when the population is secure; namely, when the total number of cliff-nesting pairs plus 25% of the pairs on man-made structures equals half of the historic total (22), at least half of the pairs produce fledglings, and productivity equals at least 1.5 fledglings per occupied nest, for at least 3 consecutive years.

Objective 1.1. Annually identify active peregrine nests statewide.

Strategy 1.1.1. Solicit observations from agency personnel and the birding community to identify nest sites.

Strategy 1.1.2. Coordinate with landowners and/or property managers to evaluate activity at established nest sites, especially those on man-made structures.

Objective 1.2. Survey all historic and other potential sites not known to be active, for nesting activity, by 2017.

Strategy 1.2.1. Select 20% of historic cliff nest sites not currently known to be active for nesting, for targeted surveys each year.

Strategy 1.2.2. Survey bridges, buildings, and smokestacks statewide to develop a list of man-made sites that fit criteria of potential nest sites.

Objective 1.3. Annually evaluate nesting success and productivity of active nest sites.

Strategy 1.3.1. Determine number of nestlings and fledglings at each occupied site.

Strategy 1.3.2. Evaluate nestling health at three to four weeks of age at all accessible sites.

Strategy 1.3.3. Wildlife Management personnel will individually mark nestlings with standard USGS numbered bands and color bands at accessible sites as long as its status is Endangered.

Objective 1.4. Monitor non-breeding population activities to identify potential nest sites.

Strategy 1.4.1. Identify sites with winter residents or floaters as potential new nesting sites.

Objective 1.5. Evaluate population status to assign proper legal protections.

Strategy 1.5.1. Upgrade the legal status to Threatened when 75% of the delisting target is achieved.

Strategy 1.5.2. Delist when population goals are achieved.

Strategy 1.5.3. Monitor a sub-set of the nesting population during a defined period after upgrading and de-listing.

GOAL 2. Identify and minimize threats to nesting peregrines to promote the recovery of a population in suitable habitat.

Objective 2.1. Evaluate habitat and nest-site features impacting breeding success.

Strategy 2.1.1. Identify characteristics of nest sites on man-made structures that may influence nesting success.

Strategy 2.1.2. Examine reproductive rates based on site characteristics.

Objective 2.2. Evaluate the effect of environmental contaminants and disease on nesting peregrines through analysis of unhatched eggs and deceased young or adults.

Strategy 2.2.1. Collect unhatched eggs or eggshell fragments.

Strategy 2.2.2. Analyze unhatched eggs and deceased young or adults for pesticide residues and other environmental contaminants.

Strategy 2.2.3. Determine sources of contaminants to which peregrines are exposed.

Strategy 2.2.4. Identify prey items and evaluate contaminants in prey items during the nesting season.

Objective 2.3. Reduce disturbance of nest sites during the nesting season.

Strategy 2.3.1. Wildlife Habitat Management - Environmental Review personnel will coordinate construction, inspection and maintenance and other work with the potential to disturb peregrine falcons on man-made structures, to reduce nest disturbance and premature fledging of young.

Strategy 2.3.2. Develop an education program for personnel at man-made sites that will help them to minimize their disturbance of nesting peregrines and reduce their apprehension of territorial defense by peregrine falcons.

Strategy 2.3.3. Secure cliff nest habitat from disturbance above and below cliff.

Strategy 2.3.4. Develop standard operating procedures that will help property owners reduce disturbance of nesting peregrines.

Objective 2.4. Diagnose and treat disease in nestlings.

Strategy 2.4.1. At the time of banding, examine nestlings for disease and treat appropriately.

Strategy 2.4.2. Retrieve seriously ill birds from nest sites for more intensive treatment.

Objective 2.5. Rehabilitate injured birds.

Strategy 2.5.1. Develop a network of wildlife rehabilitators with expertise in peregrine falcons.

Objective 2.6. Provide improved nesting structures at inadequate nest sites until delisting.

Strategy 2.6.1. Where existing nest sites have poor success, provide nest boxes on man-

made structures.

Strategy 2.6.2. Develop landowner agreements for access to cliff sites and protection from disturbance.

Strategy 2.6.3 Evaluate and improve cliff sites

Objective 2.7. Evaluate factors away from nest sites impacting the breeding population.

Strategy 2.7.1. Determine population constraints, including recruitment, dispersal, and survivorship at various ages.

GOAL 3. Increase recreational opportunities for enjoyment of peregrines.

Objective 3.1. Improve appreciation of peregrines.

Strategy 3.1.1. Educate the public on identification and natural history of peregrine falcons through electronic and digital media.

Objective 3.2. Increase viewing opportunities for the public to increase knowledge and appreciation of peregrines.

Strategy 3.2.1. Create educational materials to complement remote cameras at nest sites.

Objective 3.3. After population has recovered, provide opportunity for take of passage migrants for use in falconry following 2007 USFWS guidance.

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ACKNOWLEDGEMENTS

Peregrine falcon recovery, as experienced in Pennsylvania and across the continent, is one of the major conservation success stories of the 20th century. Under the leadership of Dr. Tom Cade, the Peregrine Fund, Inc. started the process in the 1970s and involved the Pennsylvania Game Commission at a very early point. Matt Sharp and the late Ed Fingerhood made great contributions to population monitoring and banding efforts in the early years. Ongoing peregrine work in Pennsylvania is a collaborative effort, and many individuals across the Game Commission make substantial efforts. Peregrine recovery would not continue without cooperation of property owners that host peregrine nests on man-made structures, notably the Delaware River Port Authority, the Pennsylvania Department of Transportation, and PPL Corporation. The Game Commission staff contribute substantially to education efforts: Joe Kosack’s photography and writing are key examples, and Theresa Alberici’s work with teachers brings these fascinating birds into many classrooms. Finally, peregrines engender high levels of personal commitment and people such as Bob Wasilewski, Kate St. John, Meredith Lombard, Linda Rowan, Ed Mutzer, and Scott Gregg donate a tremendous amount of personal time and dedication in monitoring and conservation.

This brief overview in no way captures the contributions of all who helped bring the peregrine falcon back into Pennsylvania or who continue to make substantive contributions.

Peregrine Falcon Recovery and Management Plan

SECTION I. LIFE HISTORY

Few birds capture the human imagination like the peregrine falcon (*Falco peregrinus*). Widely considered the world's fastest animal and the preferred bird of falconers for centuries, the peregrine is a symbol of power and grace. Following a dramatic decline as the result of environmental contaminants and a similarly dramatic recovery, the peregrine falcon also serves as a modern symbol of recovery and hope. With nesting birds within the very center of many American cities, the peregrine provides unparalleled opportunities to bring these messages into the communities of millions in our society; at the same time, such close proximity to high-density human populations magnifies difficulties for nesting peregrines. This plan documents some of the drama associated with this remarkable species and spells out the steps necessary to continue this recovery.

Taxonomy

The peregrine falcon is a cosmopolitan species, breeding on all of the world's continents except Antarctica (Brown and Amadon 1968). Peregrines show considerable variation in appearance and size across their range, and some forms are well differentiated. The species is divided into at least 19 geographical forms or subspecies (White and Boyce 1988), two of which historically occurred in Pennsylvania. The arctic subspecies (*F.p.tundrius*) nests in the high arctic of Alaska, Canada and Greenland and winters in South America, and is found across the state in low numbers during spring and fall migration. Pennsylvania's nesting population was the *anatum* subspecies (*F.p. anatum*), found in scattered locations in eastern and western North America (Cade et al. 1988). Seven subspecies, including *anatum*, were incorporated into the eastern U.S. reintroduction population (White et al. 2002).

Physical Description of Species

The peregrine falcon is a medium-sized bird of prey, second in size among falcons in the Western Hemisphere only to the gyrfalcon. Females typically weigh from 750 to 1,120 grams,

and males range from 550 to 660 grams. Wingspan ranges from 90 to 110 cm (36 to 44 inches), with males notably smaller than females. Both sexes are slate gray to bluish gray on the back as adults, with dark barring against a pale breast that ranges from pure white to rufous. The species is best identified by a dark crown and nape, with a black wedge extending below the eye, forming a distinct helmet appearance. Among its various races, the shape and extent of the hood varies. Immatures are streaked below with dark brown, and dark brown is substituted for the gray of adults. Birds begin to attain adult plumage in their second year. In flight, peregrines display the distinctive falcon shape of pointed wings and strong, shallow wing-strokes.

Habitat Requirements

Peregrines require large open areas for hunting and high, inaccessible ledges for nesting, traditionally nesting on high cliffs overlooking major river systems of central and eastern Pennsylvania (e.g., the Susquehanna and Delaware rivers). Resident adult peregrines appeared to spend much of the year in the vicinity of nest sites, vacating nesting territories for only a few months in the middle of winter (Poole 1964). This contrasts sharply with the migratory habits of other subspecies. Since the species was reestablished in the 1980s, at least some birds remain on territory as permanent residents.

Peregrines do not build nests, but lay their clutch in a shallow indentation in the ground scratched out with the talons. They are also known to use nests built by other cliff-nesting species, most notably the common raven (*Corvus corax*). Nests are typically placed on high, inaccessible locations, often near water. Nesting sites must be steep enough to afford the falcons protection from potential mammalian nest predators. Cliffs or structures that are topographically varied with recesses and overhangs for shelter will provide more locations for the nest scrape. Nest sites must also have ledges large enough to accommodate the clutch and brood (Ratcliffe 1993).

Modern urban nesting locations include tall buildings and bridges throughout the state. Nests on bridges often are placed within enclosed steel beams accessible through holes of various sizes,

on gusset plates or catwalks, or on the top of concrete piers. Buildings have long been used in Europe and have historical precedent in Pennsylvania. Typical locations on buildings are ledges and small rooftops with a southern or western exposure. Nesting birds use only existing substrate for nesting material at man-made structures just as at cliff sites.

Characteristics of bridges used for nesting has broadened considerably since peregrines were first discovered on bridges in the Philadelphia area. Sites used in the early years of the recovery were among the tallest bridges in the state. By the late 1990s, much smaller bridges were occupied. Those in the Wilkes-Barre area are less than 60 feet above the river level and readily accessible to foot traffic. Potentially, thousands of bridges like the Wilkes-Barre Market Street, the Route 92 Bridge in Pittston, the Schuylkill River Bridge in downtown Philadelphia, and the bridges in Columbia, McElhattan and Clark's Ferry may be found across the state. If the use of these sites expands, then the state's population could increase significantly.

As was the case with bridges, buildings used for nesting were initially limited to very tall structures. The nest on the Rachel Carson State Office Building is on the 15th floor, and the building sites in Pittsburgh are higher. More recently, lower building locations have hosted successful peregrine falcon nests; these include those at the Three Mile Island and Brunner Island power plants, a ninth-floor balcony in Reading and a church steeple in the Manayunk district of Philadelphia. Prior to the DDT (dichloro-diphenyl-trichloroethane) era, all but one nest in the Commonwealth was on a natural cliff.

Feeding Ecology

Peregrines feed nearly exclusively on live birds captured in flight. The majority of prey items range in size from 50 to 500 grams. However, there is no apparent lower limit to the size of potential prey, with peregrines taking small birds such as chimney swifts (*Chaetura pelagica*) (D.W. Brauning, pers. obs.), and birds as large as black grouse (*Tetrao tetrix*) at 1250 to 1400g in the United Kingdom (Ratcliffe 1993). A wide range of species has been found at Pennsylvania nest sites in recent years, with northern flicker (*Colaptes auratus*), blue jay (*Cyanocitta cristata*),

and rock pigeon (*Columba livia*) frequently encountered (e.g., Brauning 1988), although the former two (flicker and jay) may be proportionally over-reported because of their conspicuously-colored feathers. Little is known of specific prey preferences at historic eyries in Pennsylvania. A former common name of the eastern peregrine, duck hawk, suggests a popular diet. However, the peregrine is clearly an opportunistic species, taking advantage of appropriately-sized prey species as they become locally available (Ratcliffe 1993).

Historically, most hunting activity in Pennsylvania was confined to open areas along rivers or above the forest canopy. Peregrine populations probably benefited from clearing of the land and agricultural development in the 19th century due to the increased availability of certain prey and additional open foraging areas. It is difficult to predict the effect on peregrines of ongoing human alterations of the landscape since the DDT era, such as the reversion of farmland to forest and the increase in number of tall buildings and bridges.

Breeding Behavior and Timing

The breeding cycle begins with attraction of a mate and pair bonding. Elaborate courtship may be observed at this time with aerobatic flights, exchange of food items from male to female and loud vocalizations. Characteristic courtship displays have been described and illustrated (Ratcliffe 1993). Pairs are conspicuous during this time, typically from late February through April. A peregrine generally returns to the same nest site each year and remains paired with the same mate until one member of the pair dies or is driven off. Males actively solicit for a mate when no female is present.

The normal clutch is four eggs, laid on alternate days. Incubation, usually initiated when the third egg is laid, is 31 to 35 days (Ratcliffe 1993; F.A. McMorris, pers. obs.). Clutches of three or five eggs are common. Both sexes share incubation. The male takes a lesser role, often replacing the female after catching prey in the early morning. Hatching is roughly synchronous. Young begin moving around the nesting area at 4 weeks of age and fledge at 40 to 46 days of age, males fledging several days earlier than females. Incubation typically begins in late March or early

April, with fledging mid- to late June. Some pairs in Pennsylvania have established a pattern of egg-laying beginning as early as late February. Clutches found in June or July are assumed to be due to replacements of earlier failed nesting attempts or to delayed recruitment of a replacement mate, not second broods.

The chicks can stand in the nest at about three weeks and begin tearing food and feeding themselves shortly thereafter. The nest site is very active, with fights over food common and mobbing of adults frequent prior to fledging (Sherrod 1983). Young are totally dependent on adults for several weeks after fledging and may remain with them for several months, occasionally being found near the nest site as late as October or even until the initiation of breeding the next season. Patterns of juvenile dispersal are largely unknown, although satellite-telemetry studies indicate that some falcons spend at least their first winter in Central or South America while others may remain in North America (Canadian Peregrine Foundation 2000; Falcon Trak 2000).

Most female peregrines begin breeding when two years old; males tend to delay reproductive activity, often not nesting until three years old, although both sexes have nested successfully as one-year-olds (Ratcliffe 1993; McMorris and Brauning 2005, 2007, 2009). Adults have remained active at nest sites for over 12 years in the wild (D.W. Brauning, pers. obs.; McMorris and Brauning, 2009, 2010).

In many cases, one or both members of a nesting pair remain on their nesting territory year-round. Adults that depart typically do so for only 2-3 months in mid-winter. Very little is known about where these departed birds overwinter, although some have been identified at wintering sites within 10-20 miles of their nest site.

SECTION II. POPULATION STATUS IN PENNSYLVANIA

Historical Population

Pennsylvania was at the heart of the distribution of the Eastern population of the *anatum*

subspecies. The Eastern population was estimated at 350 nesting pairs in the early decades of the twentieth century (Hickey 1942). Most of these birds were found in the Appalachian mountain chain nesting on cliffs, although some were found on coastal cliffs. This population ranged from the southern Appalachians north through the Canadian Maritimes.

Some of Pennsylvania's earliest ornithological authors (Turnbull 1869; Libhart 1869) list the species as a breeder. Oologists, eager to include the prized eggs in their collections, reported at least 44 nest sites (Figure 1, Appendix A Historic peregrine falcon breeding locations). Cliffs overlooking the Delaware, Susquehanna, and Juniata rivers and their tributaries were preferred locations (Poole 1964). The list encompassed more than 21 counties, including Westmoreland in the southwest (Poole 1960). Nesting was confirmed even on Philadelphia's City Hall for several years (Groskin 1947, 1952).

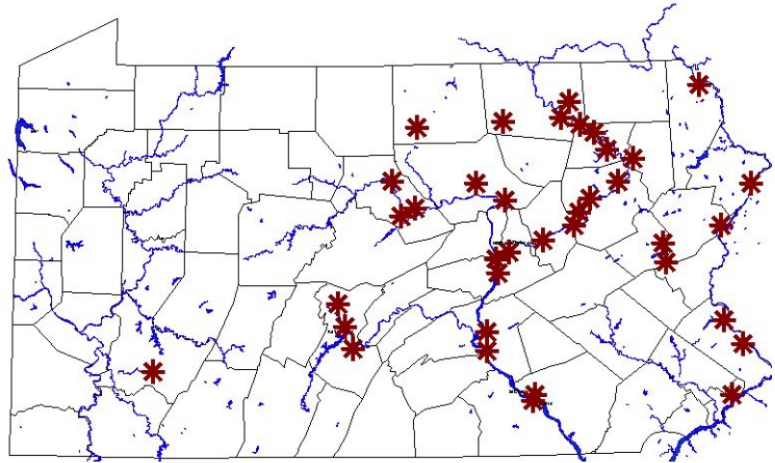


Figure 1. Historic (pre-DDT) nest site locations for peregrine falcons in Pennsylvania.

The breeding population of peregrines in Pennsylvania appears to have been 40 to 50 pairs. Evidence from the early decades of the twentieth century indicated that many, if not most, of the eyries were regularly occupied. Extensive surveys of the species in the 1930s documented routine occupancy at many sites (Hickey 1969). Occupancy was frequently confirmed by nestlings being taken by falconers and eggs being removed by oologists.

Population Decline

Within the brief period between the mid-1940s and 1965, reproductive success dropped sharply. Occupancy of eyries in the eastern United States was spotty by 1951 and only single birds

remained at most locations after 1957 (Hickey 1969). They were eradicated from most of the eastern United States by about 1960 (Anderson 1965; Hickey 1969). Poole (1960) documented no nesting in Pennsylvania by 1960. The last successful nesting in Pennsylvania was in 1957, with pairs present until 1959 (Rice 1969). Extensive surveys in 1964 that reexamined Hickey's previous surveys found no occupied territories in the eastern United States (Berger et al. 1969).

The collapse of the peregrine falcon population in the eastern United States was characteristic of declines in this species worldwide. Similar declines were experienced by other birds of prey, most notably the bald eagle, (*Haliaeetus leucocephalus*), and to a lesser extent other species (e.g., osprey, (*Pandion haliaetus*)). These declines were primarily attributed to failed reproduction, rather than other factors. The primary culprit was eventually identified as chlorinated hydrocarbons, most notably DDT (dichloro-diphenyl-trichloroethane) and its breakdown product DDE (dichloro-diphenyl-dichloroethylene), causing reduction of eggshell thickness and resulting in egg failure (Ratcliffe 1993). DDT use became widespread at the end of World War II, but was not implicated in reproductive failure of birds of prey until the late 1960s. Eggshell thickness was found to be closely related to levels of chlorinated hydrocarbons (Hickey and Anderson 1968; Cade et al. 1988).

Regulation of chlorinated hydrocarbons began in the 1960s, and DDT was banned in the United States in 1972 (Dunlap 1981) and in Britain in 1975 (Ratcliffe 1993). Levels of DDE in peregrine eggs began to decline with the restricted use of these substances, setting the stage for recovery of breeding populations.

Early Recovery Efforts

In 1974, the Peregrine Fund, based at Cornell University, began a program of experimental releases of captive-bred peregrines in the eastern United States. Propagation stock was predominately from falconers' birds of mixed genetic origin, including subspecies from around the world. Young were released by a method known as hacking (Cade and Temple 1977; Barclay and Cade 1983). More than one thousand peregrines were hacked into the eastern United States

by the Peregrine Fund between 1975 and 1992 (Peregrine Fund 1992). More than half of these releases were conducted at coastal towers and on urban buildings. Peregrines were released at a number of sites in the southern Appalachian Mountains after 1990, but the Peregrine Fund no longer sponsored widespread releases as the eastern population approached the recovery goal of 100 pairs. Reintroduced peregrines began nesting in 1979 at a coastal hacking tower in New Jersey.

Between 1992 and 1998 the number of territorial pairs in the eastern U.S. grew about 10% annually and productivity averaged 1.5 young per nesting pair (USFWS 1999). This recovery achieved all de-listing goals established by the USFWS. In 1998, when the eastern U.S. breeding population reached 193 nesting pairs, de-listing was proposed by the US Fish and Wildlife Service (USFWS 1998). In August of 1999 the species was removed from the federal list of endangered species (USFWS 1999). Since then, the population continued to grow substantially, and was estimated to be 336 pairs in 2003 (Green et. al 2006).

Among the earliest locations selected for release in Pennsylvania were historic nest sites near Towanda, Bradford County, in northeastern Pennsylvania, and the Dauphin Narrows, Dauphin County. The young released at those sites were lost to predation, probably by great horned owls, (*Bubo virginianus*). As a result of these and similar losses elsewhere, peregrine releases were curtailed at cliff sites where great horned owl predation was perceived to be a risk. Hacking was resumed in Pennsylvania in 1981 by the Peregrine Fund, in cooperation with the Pennsylvania Game Commission, when four young were successfully introduced in downtown Philadelphia.

Between 1993 and 1998, additional releases were conducted in Pennsylvania under direction of the Pennsylvania Game Commission in order to bolster the state's nesting population and promote use of historic cliffs. A total of 59 birds were released on buildings in Allentown, Harrisburg, Reading, and Williamsport as part of this effort (Brauning 1999). Young were obtained for reintroduction from captive bred pairs and by removing eggs or young from wild nesting adults. Double clutching of wild pairs (pulling eggs and production of replacement

clutches) has the advantage of increasing the reproductive output of a given pair. Active reintroduction is primarily useful where recruitment of wild birds is not likely.

Pennsylvania Population Growth in Distribution and Abundance

In 1984, nesting was confirmed on a bridge on the New Jersey side of the Delaware River. Three years later, in 1987, the first nesting attempt in Pennsylvania in 30 years was discovered by the Peregrine Fund's Jim Weaver during an inspection of the Walt Whitman Bridge (Cade and Dague 1987). Although the eggs at the Walt Whitman Bridge failed to hatch, nestlings were found on the Girard Point Bridge the following year. Inspection of the Girard Point Bridge strongly suggested that previous nesting attempts had gone unnoticed. Pre-fledging age young were discovered near the base of the Commodore Barry Bridge in 1988 and at the Walt Whitman Bridge in 1989, where a pair had been present since at least 1986. Nesting occurred almost annually during the late 1990s on the Girard Point Bridge on the Schuylkill River and on the Pennsylvania or New Jersey sides of the Commodore Barry, Walt Whitman, Betsy Ross and Pennsylvania/New Jersey Turnpike Delaware River bridges (Appendix B, Fledglings produced by nest site,). A nest at Philadelphia City Hall, the only historic nest site on a man-made structure in Pennsylvania, has been intermittently occupied since 1991.

In the late 1990s, with the additional reintroductions, the population expanded to include pairs nesting on buildings in the Harrisburg and Pittsburgh areas and bridges in the Wilkes-Barre area, reaching 9 nesting pairs by 2001 (Figure 2). In 2002 a pair was found breeding at the Three Mile Island nuclear power plant in Middletown, and in 2005 a pair bred in a nest box mounted on a smokestack at the Martin's Creek PPL power plant. A major milestone was achieved when, in 2003, nesting was confirmed on a cliff in Lycoming County downstream from Montgomery, the first natural nest site producing young in 45 years (McMorris and Brauning 2004). In 2005 a pair relocated from a bridge to a nearby cliff and other nesting activity has been initiated on historic cliffs. By 2011, pairs occupied 32 locations across Pennsylvania (Figures 2 and 3).

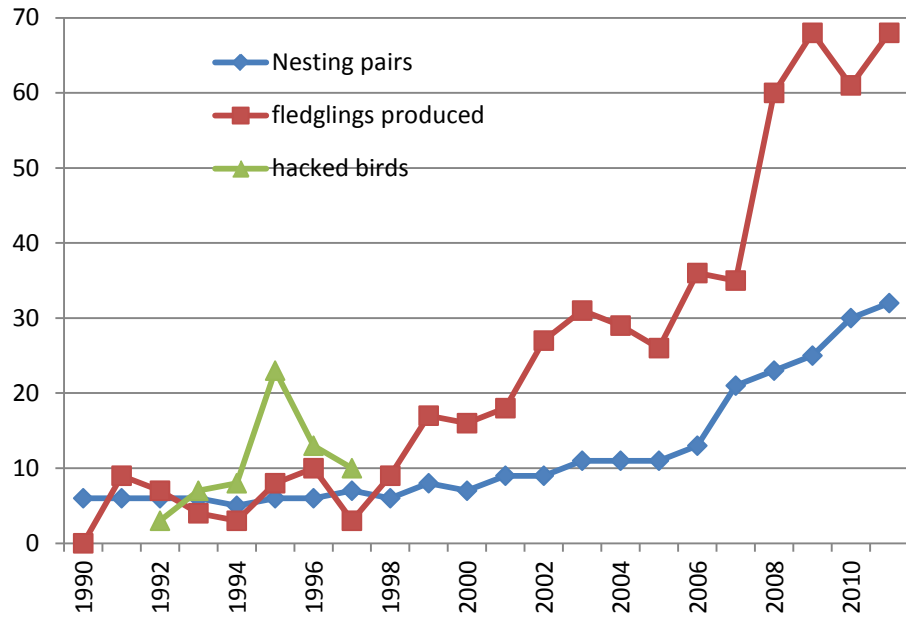


Figure 2. Peregrine falcon productivity in Pennsylvania from 1990 to 2011.

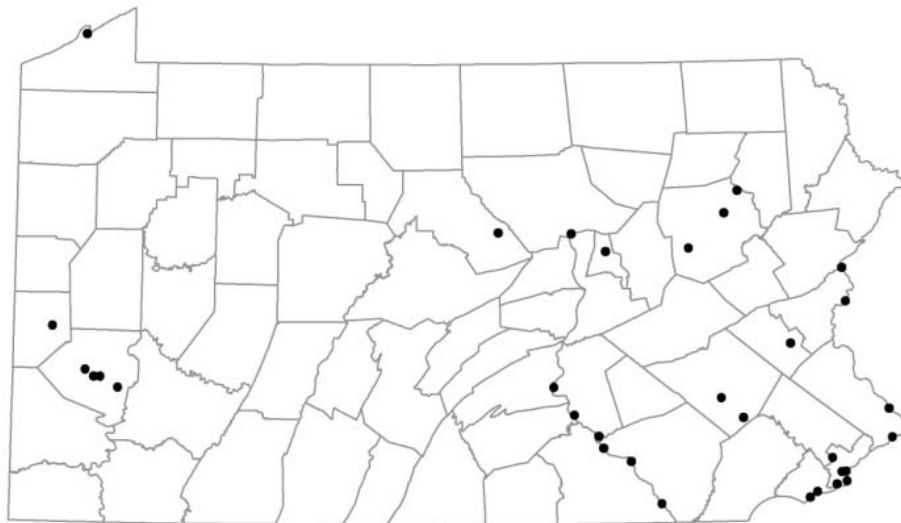


Figure 3. 2011 peregrine falcon nest locations.

The vast majority of sites remain on man-made structures. In 2011, only 5 of the occupied nests were on cliff ledges, yet this was the highest number of cliff nests in the post-DDT era. The

remaining 27 nests, over 80% of the total, were on bridges, buildings or smokestacks. Non-breeding populations are monitored in migration at traditional hawk concentration points, primarily along Pennsylvania's ridges, including the world-renowned Hawk Mountain Sanctuary, one of the longest running hawk migration monitoring sites in the world (Bednarz et al. 1990). Pennsylvania's network of hawk migration sites is coordinated through the Hawk Migration Association of North America, which publishes migrant data (HMANA 2012).

Population Dynamics

The population in the eastern United States has grown steadily. New locations were discovered each year from 1980, when the first pair began nesting, through 1998 when it reached approximately 193 pairs (USFWS 1999), resulting in the species removal from the federal Endangered Species list. The number of pairs in Pennsylvania grew at a rate of one pair every two years through 2006; eight pairs were added in 2007; and 2 or more have been added each year since 2007. The population expanded to 32 nests in 2011 (Figure 2).

Productivity varies considerably among nest sites. Average productivity has increased since the 1990s, from below the replacement value of 1.5 young per nesting pair during many years to an average above 2.0 during most years since 2000. The best information on nest-site productivity comes from visiting the nest. Clutch size and hatching success – issues associated with historic declines – and nestling health are evaluated during visits.

In recent years (2009-2011), productivity at nest sites occupied at least 3 years averaged 2.5 young per year, with productivity on bridges increasing to 2.2. Productivity on bridges increased as a result of intensive management work (described below), surpassing replacement levels in all years since 2000. Cliff sites have been too few to permit accurate comparison, but productivity has generally been above replacement levels, averaging 1.6 per occupied nest. Statewide, total production has exceeded 25 young per year annually since 2002, and 60 or more since 2008.

The breeding population has grown steadily while reproductive success has increased steadily. Other factors, such as post-fledging mortality, competition for nest sites, or adult survivorship

may be limiting the rate of growth in the number of pairs. The large jump in occupied nests in 2007 suggests that this key component of recovery is catching up to the overall success that the species is experiencing here and across the region.

Banding of Nestlings

Since the reintroduction of peregrines, the Peregrine Fund and state agencies have maintained an aggressive program of banding young released during hacking programs or produced by wild pairs at nest sites. As a result, many nesting adult peregrine falcons could be identified by their bands. Banding continues to be conducted under a federal permit issued by the U.S. Geological Survey, Bird Banding Laboratory, which establishes minimum standards and skills required to handle and band birds, and a state permit issued by PGC. This oversight, recently tightened, is designed to assure consistency of banding practice and to minimize negative effects associated with human handling of birds during banding. As a result, Wildlife Management personnel will conduct banding, assuring consistency across the state and maintaining the necessary oversight, record keeping, and inventory of bands to meet Bird Banding Laboratory expectations. The Bureau of Wildlife Management may designate other PGC personnel or non-PGC collaborators, who are qualified per state and federal banding guidelines, to conduct banding under the direction and supervision of Wildlife Management. Banding provides the opportunity to determine clutch sizes, evaluate nestlings for disease, and evaluate nest sites for threats to nestlings, and as such continues to be a useful activity in monitoring peregrine populations, but will be scaled back after the population is considered secure.

Through this banding effort, many birds nesting on buildings have been individually identified, but logistical difficulties of observing adults on bridges and cliffs makes it difficult to determine nesting activity. The adults which first bred in Pittsburgh were hacked at cliff sites in the southern Appalachian Mountains. The adult female first found nesting at the Girard Point Bridge was raised on a coastal tower site by a hacked pair. The female nesting on the Rachel Carson State Office Building in Harrisburg in the summer of 2000 was hatched on the Girard Point Bridge in Philadelphia (Brauning 2000). In recent years, the origins of approximately half of the

breeding adults have been identified by their band combinations each year. Current nesting adults came from nests in Pennsylvania, Ohio, Virginia, Maryland, New Jersey, New York, Connecticut, Massachusetts, Vermont, Wisconsin and Ontario. Most of those nests were on man-made structures. Forty percent of the identified breeders originated at Pennsylvania nests, sometimes 20 miles or less from where they are currently nesting. Conversely, young banded at Pennsylvania nests in recent years have been found, often breeding, at numerous locations in the northeastern and Midwestern United States and southeastern Canada (McMorris and Brauning, 2008, 2011).

Lifespan of adults, reproductive success of individual birds, and dispersal information are all-important elements of population models that require individually marked birds. This information is most easily obtained from color-banded individuals. Nestlings have been color banded since 1992.

The Pennsylvania breeding adults normally remain on nest territories until they are about ten years old. Active competition for nest sites by males and females results in a turnover of some breeders. In some cases, an adult is violently replaced by a younger bird of the same sex. The fate of the original breeder is not always known, but on-line video surveillance at the Gulf Tower in Pittsburgh in March 2003 documented the decapitation of the resident male and replacement by a male fledged the previous year at the University of Pittsburgh Cathedral of Learning nest.

Juvenile Dispersal

Banding efforts across the range of this species have added significantly to our understanding of dispersal movements. Birds have been found within a few months to over 9 years after dispersal. The majority of post-dispersal recoveries are found as nesting adults.

Juvenile dispersal was evaluated in more detail using satellite telemetry in 2002 and 2003. Four young birds, 2 males and 2 females, were followed. They remained near their nest sites for 4 to 8 weeks after fledging. Sporadic and seemingly random movements of variable lengths became

more frequent as the birds matured during the pre-dispersal period. Actual dispersal involved a flight of significant distance from the nest area over 2 days to about 3 weeks. The direction of these flights was inconsistent. Winter territories were occupied in southern Delmarva Peninsula, Virginia; New York City metropolitan area; Philadelphia, Pennsylvania; and northern New Jersey. Summer territories were established for each of the four birds marked in 2002: on the central New Jersey coast, in northern New Jersey near New York City, in Philadelphia; and in Hamilton, Ontario, Canada (McMorris and Brauning 2005).

Threats and Limiting Factors

Disease, toxins, nest site disturbance, fledging hazards, falconry, and predation can all have a negative impact on population growth and recovery of peregrines (Peregrine Fund 1990). Each is discussed in detail below.

Disease

Nestling peregrines are susceptible to disease, primarily Trichomoniasis, a protozoan infection acquired from pigeons, and Aspergillosis, an airborne fungal infection. Although adults probably carry low-level Trichomonas infections, nestlings are often unable to overcome the infection during development. Trichomoniasis has been found in nestlings as early as 5 days of age and identified as a direct cause of death. Death most frequently occurs as a result of starvation from a blocked esophagus. Aspergillosis, a respiratory fungal infection, has contributed to the loss of nestlings (Brauning and Dooley 1991). The replacement of breeders sometimes seems to reduce the incidence of disease at sites.

Toxins

Toxic contamination is a potential threat to hatchings, nestlings and adults. Since the historical decline of peregrines is largely attributed to chlorinated hydrocarbon toxicity, environmental contamination should always be monitored with higher-order predators. Current attention is on polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs) and lead. Recent contaminant analyses of Delaware Bay peregrine falcon eggs in New Jersey indicate that DDE levels are sufficiently elevated to produce eggshell thinning (Kane *et al.*, 2004). The U.S. Fish

and Wildlife Service and the New Jersey Division of Fish, Game, and Wildlife are investigating environmental contaminants, including PCBs and DDT metabolites. Contact with avicides through secondary contact with pigeon control substances is a potential concern.

Nest Site Disturbance

Nesting birds are vulnerable to disturbance of a variety of types. The fact that most active nests today are on man-made structures frequently brings them into conflict with routine human activities. Bridge maintenance and inspection activities are a persistent concern, particularly during the pre-laying, incubation and fledging periods of the breeding season, when minimizing disturbance is critical. Nests on buildings are subject to similar problems with maintenance of rooftop equipment, window washing, and other related activities. Rock climbers may disturb birds nesting on traditional cliffs (Lanier and Joseph 1989), but few of Pennsylvania's traditional eyries receive recreational rock climbing. Delaware Water Gap is a notable exception, where coordination with National Park Service personnel assures that recreation does not disturb birds attempting to nest there.

Fledging Hazards

Unmodified nest sites on bridges often are confining and lack adequate space for young birds to fledge safely. Young are frequently unable to access perches where they can develop their flying abilities. Newly fledged young have been found in the river below bridge nest sites. Automobile strikes are another documented cause of death on bridges, particularly with nests above the roadway. Juvenile birds in particular are inexperienced with the dangers of the auto traffic. As a result of these risks, poor fledging success contributes considerably to reduced productivity on bridges in particular. Urban hazards in general continue to result in juvenile mortality at both bridge and building nest sites.

Falconry

Removal of the peregrine falcon from the U.S. Fish and Wildlife Service Endangered Species list opened the door to renewed take for falconry in North America. An Environmental Assessment resulted in a "Finding of No Significant Impact" regarding falconry take of nestlings (USFWS

2004) and a sustainable harvest of migrant birds in the eastern U.S. has subsequently been adopted (USFWS 2007) and implemented since 2010. Incidental harvest of eastern birds is considered acceptable if kept below one percent of the annual production. Current Pennsylvania Endangered status prohibits take of peregrines as nestlings or migrants. Migrant take from Eastern states is now allocated through the Atlantic Flyway Council, which allocates 12 take permits across the Eastern states. Poaching of young has not been documented in Pennsylvania for any purpose, but vigilance should be maintained to avoid a possible impact on productivity and recruitment at particular sites.

Predation

Adult peregrines are almost immune to predation from other species. Mammalian predators rarely gain access to perches or nest sites traditionally used by peregrines. However, raccoons, (*Procyon lotor*) have been trapped and removed from the Ben Franklin Bridge (J. Baker *pers. com.*) and there is the possibility of nest predation on eggs by Norway rats, (*Rattus norvegicus*), at least on Delaware River bridges. The great horned owl is the only avian predator in Pennsylvania that is capable of taking the species. Nestlings and recent fledglings are particularly vulnerable, but adults have been taken. Hacked young are especially vulnerable. Great horned owl depredation was the primary reason for discontinuing hacking at low cliffs (Barclay 1988). It is unknown whether owls contribute to the slow recruitment of peregrines to historic cliff sites.

Differences in threats at man-made vs. natural sites

Peregrine falcons nesting on man-made structures encounter conditions that are different in many ways from those prevailing at natural cliff sites, with significant consequences for nesting success. Although success and productivity at man-made sites has been very good, much of that success was facilitated by active management, conflict resolution and intervention on behalf of fledged young. Nest ledges on bridges, buildings and smokestacks are often of poor quality, or non-existent, and consequently nest boxes or other enhancements have been provided at over 40% of those sites. Nest boxes were provided at some sites after peregrine falcons arrived and nested with poor success, whereas at many other sites (e.g. smokestacks), nest boxes were placed first, in an attempt to attract falcons, and often provide the only possible nest site on these

structures. Nest box maintenance requires the continuing cooperation of landowners and site managers. Nesting on structures made by humans exposes the birds to many forms of disturbance: bridge and building inspection, painting, window washing, repairs ranging from minor to extensive, maintenance of antennas and air conditioning equipment, and simple curiosity by members of the public. The Pennsylvania Game Commission educates bridge, building and plant owners and managers to reduce disturbance from these sources; support ranges from making owners and managers aware of the Endangered status of peregrine falcons in Pennsylvania, to employee training for successful work activity with nesting peregrines nearby. The extent to which this contributes to their willingness to cooperate can only be conjectured. Additionally, newly-fledged falcons often have difficulty maintaining altitude and finding a suitable perch. When this happens at man-made nest sites, it often results in the bird becoming grounded on the street or sidewalk, or in the river. Fledglings are frequently rescued from life-threatening situations, again requiring active maintenance and a high degree of public interest and cooperation. Given the frequency with which grounded fledglings are found and rescued, it is almost certain that many are lost without being detected. Additionally, nests at man-made sites expose the birds to other hazards endemic to the location. Mortality from building and vehicle strikes is all too common, and the birds are exposed to urban pollution, industrial chemicals, and avicides used for pigeon control.

Nesting on man-made structures is not without benefits. Urban and industrial settings offer abundant prey in the form of pigeons, starlings and other urban birds, and predator pressure is less than at natural sites. Indeed, these are the reasons that urban sites were used for releases during the re-introduction period. However, given the many threats to which these birds are exposed and their dependence on human assistance, it is uncertain whether a population of urban-nesting peregrine falcons can be considered wild, secure or self-sustaining.

Relative Contributions of Nests at Man-made versus Natural Sites

Because of threats and limiting factors at man-made sites, the value of these nests is considerably less than is initially apparent from standard data. The standard measures of reproduction, nesting

success and productivity, are calculated when nestlings fledge. However, many young falcons die soon after fledging, or are rescued from life-threatening situations, due to hazards that are specific to the man-made environment. These hazards include building collisions (glass or otherwise), urban power lines, grounding on streets, collisions with vehicles, falling into the river, etc. These losses are not reflected in standard success and productivity data, and our calculation of post-fledging losses does not include losses that are averted by rescues. Data from an urban site in Pennsylvania reveal that 50% of the peregrines that were raised at that site and subsequently found nesting, had been rescued soon after fledging, sometimes rescued repeatedly. Thus, if those fledglings had not been rescued from life-threatening situations, fully half the contribution of that urban nest to the breeding population would have been lost. A study in southern Ontario reported similar results: 44% of the peregrines raised on man-made structures and subsequently found nesting were rescued soon after fledging (Gahbauer et al., 2012). If delisting results in a lower level of public vigilance and human assistance, the contributions of those urban nests to the population would be correspondingly reduced. When actual deaths as well as rescues are considered at a representative building site in Pennsylvania during the 13-year period from 2000 to 2012, 60% of the fledglings were lost, either actually or potentially (but rescued), due to hazards specific to nests on man-made structures. Fledglings raised on bridge face additional hazards (e.g. becoming “grounded” in the river and drowning), and are less amenable to rescue.

Compounding the losses of fledglings, the nests on man-made structures are themselves frequently lost, either actually or potentially, due to disturbance directly related to the nature of the nest location. As detailed above, repairs and maintenance are common sources of disturbance. Additionally, nest boxes are sometimes removed by property owners. PGC coordinates with building, bridge and plant managers and negotiates restrictions, often at significant inconvenience and expense to the owners and managers, to reduce disturbance that could result in nest failure or abandonment. Over two-thirds of the sites on man-made structures in Pennsylvania are under agreements, or in negotiations for agreements, to reduce nest disturbance; and one-fourth have nevertheless experienced failures or abandonment as the direct

result of disturbance. Even the highest-profile sites, where cooperation is excellent and public attention is strong, are not immune from disturbance-induced failure or abandonment. We can only speculate as to the level of voluntary cooperation that can be expected once the species is removed from the Pennsylvania Endangered Species list.

In setting a population recovery target that is based on the size of the population before the DDT era, it is necessary to take into account any relevant differences in the two populations. The increased fledgling mortality at man-made sites, together with the insecurity of the nests, further compounded by the likelihood that losses may increase once the species is de-listed and human assistance is relaxed, must be accounted for in any de-listing target. Combining the data for increased mortality and decreased nest security at man-made nests results in the estimate that four nests on man-made structures make a similar contribution to population growth and stability as one nest at a natural site. This equivalency estimate is reflected in the target for initiating de-listing, specified in Goal 1.

SECTION III. RECREATIONAL SIGNIFICANCE

The peregrine falcon is listed as an endangered species in Pennsylvania and given full protection. It is renowned for its great flying ability and speed. The peregrine is the premier bird of falconry. There is a high level of public interest in the welfare of this species, and the media appear to have an insatiable interest in stories regarding its conservation. Webcams at the Harrisburg and Pittsburgh peregrine falcon nests are heavily visited, and nesting peregrine falcons attract a high level of public attention and coverage by the broadcast and print media. Peregrine falcon essay contests at area schools and related activities are popular, and banding events where public attendance can be accommodated attract overflow crowds. Peregrine falcon sightings are widely publicized in online bird discussion groups and engender much excitement.

Recreational Value and Interest Groups

The peregrine falcon has a long association with man as a bird of falconry, and falconers deserve a large share of the credit for reestablishing the species in the United States. A plan to allow a

limited take of peregrines in the western United States has been adopted by the U.S. Fish and Wildlife Service (2000) and a draft rule for take of migrants in the East was proposed in November 2007 (USFWS 2007). The plan limits any take of peregrines to 1% of annual productivity in the East.

Regulatory Authority and Responsibility

Several federal and state laws provide protection for raptors, including peregrines. The most important federal statutes and treaties are the Migratory Bird Treaty Act and the Convention of International Trade in Endangered Species (CITES). The U.S. Fish and Wildlife Service administers these laws. Raptors, including falcons, were placed on the Federally Protected Migratory Bird List in March 1972. The peregrine falcon is not currently listed under the federal Endangered Species Act. The U.S. Fish and Wildlife Service adopted a de-listing monitoring plan in 2001. A single nest site in Pennsylvania is monitored as part of the national de-listing plan.

A recovery plan was drafted by the Eastern Peregrine Falcon Recovery Team and adopted, as revised, by the U.S. Fish and Wildlife Service (1987). That plan establishes the recovery regions, goals, and operational procedures guiding this planning document. The recovery objective, specified in that plan, was to establish 175 to 200 pairs in the East, or approximately 50% of the numbers estimated to have been present in the 1940s, with a minimum of 20 to 25 nesting pairs in each of five recovery regions (a combined total of 62.5% of the recovery goal). Three recovery regions fall into Pennsylvania; the central Appalachians that included almost all of the 44 historical cliff sites, the mid-Atlantic coast including Philadelphia and most modern bridge sites, and the southern Appalachians, of which the Pittsburgh area is the only likely nesting location. State goals are scaled proportionally to the eastern recovery team goals.

The 1999 peregrine falcon de-listing by the U.S. Fish and Wildlife Service was a significant milestone in the recovery of this species. This action does not suggest the end of conservation activity; several subsequent rulings and post de-listing monitoring have emphasized the importance of continued conservation action on behalf of the peregrine falcon. The banning of

DDT as well as several other organochlorides such as Lindane and Aldrin removed the primary threat to the species, and management activities such as the release of captive-bred falcons have reestablished the population. Continued use of organochlorides in Central and South America, on the wintering grounds of peregrines and some of their prey, combined with the persistence of organochlorides in North America, calls for continued contaminant monitoring.

SECTION IV. MANAGEMENT OPTIONS

Recovery Potential

With the advent of urban and bridge nesting, the number of potential sites in Pennsylvania exceeds the 44 historical locations. Potential habitat now includes buildings and bridges tall enough to attract falcons and contain suitable nest sites. The Philadelphia metropolitan area includes six bridges that have supported breeding pairs and two more where peregrines have been sighted, and tall buildings in the downtown area support one pair and potentially more. The Pittsburgh area, which is outside the state's historic breeding range, supports two pairs on buildings and 4 on bridges. At least nine cities (Allentown, Altoona, Bethlehem, Erie, Harrisburg, Lancaster, Reading, Scranton, and Wilkes-Barre) contain buildings tall enough to support nesting peregrines. As described in the Habitat section, modest-sized bridges, such as those used since 1998, could provide a large number of suitable locations. There are approximately 25,000 bridges on Pennsylvania motorways, with 10-30% of them being comparable in size to the Pittston, Wilkes-Barre, Schuylkill Expressway, Columbia, Clark's Ferry and McElhattan bridges that have supported successful nests in recent years (R. Eppley, PennDOT, pers. comm.). Additional research is needed to evaluate the number of bridges suitable for nesting. Many of these bridges were present before the DDT era, yet were not known to be used for nesting; but modest-size bridges represent a substantial pool of potential nest sites. At least 10 building sites and a large number of bridges are available to the population in addition to the 44 historic cliff sites. Large rock quarries provide additional potential habitat, as evidenced by the pair that was found nesting in an abandoned quarry in French Creek State Park in 2011.

Few species have received such intensive management as has the peregrine falcon in the forms of captive propagation, reintroduction, and nest-site management. Management activities since the mid-1990s have begun to focus on maintenance and de-emphasize recovery. Protection and enhancement of occupied nest sites continues to be a priority, including sites in both man-made and natural situations.

Healthy reproduction is critical to sustained population growth and a component for which we can effect some positive contribution. As long as the peregrine is listed as endangered or threatened, reproductive success should be carefully monitored at all nest sites, particularly during the fledging stage. Surveys should be implemented to determine the number of nesting pairs in natural and man-made situations. The Game Commission will continue to follow, and encourage others to follow, peregrine falcon operational documents (e.g. BMPs, survey protocols, and others) to maximize the recovery potential for this species on its way back to a healthy self-sustaining population.

Monitoring During Recovery and After Delisting

Monitoring of peregrine falcons will continue when the species is upgraded from Endangered to Threatened, and after delisting. Monitoring after upgrading will be needed to verify that the population continues in its trajectory towards a level that would trigger delisting; and monitoring during the post-delisting period will verify that the population continues to do well and does not decline to a level that would warrant concern and possible actions to promote a return to recovery.

The following will be done during the entire period the peregrine falcon is upgraded to Threatened, until it is delisted (i.e. before it has been removed from the Pennsylvania Endangered/Threatened list):

A. Nest observations. Nest observations will continue without change. All known and suspected

nest sites will be observed by agency staff and local volunteers coordinated by Wildlife Diversity staff; volunteers are enthusiastic, knowledgeable about the sites and falcons they monitor, and invested in ensuring the recovery of the peregrine falcon population. Observations will ascertain nest site occupancy, nesting activity, fledging success, productivity and post-fledging mortality, especially during the 1-month period after fledging.

B. Nest visits. Nest site visits to verify nesting results (e.g. number of nestlings, unhatched eggs, nestling health, etc.) and band nestlings will continue at all cliff nests that are active during the year that the species is upgraded, up to 6, plus 10% of all remaining cliff nests, so that all will be visited on a 10-year cycle. The 10% of cliff nests visited each year will be chosen to be representative of those across the state, both geographically and in their individual characteristics.

Visits to nests on man-made structures to verify nesting results and band young will continue at the University of Pittsburgh Cathedral of Learning in Pittsburgh, the Rachel Carson State Office Building in Harrisburg, and City Hall in Philadelphia, plus 10% of the remaining nests on man-made structures, so that all will be visited on a 10-year cycle. The 10% chosen each year will be representative of the statewide population in geographic location and individual characteristics.

If the peregrine falcon is delisted before it has been on the Threatened list for 10 years, the 10-year cycle described above will be terminated.

If while Threatened, the peregrine population parameters fall below the minimums used to justify moving the species from Endangered to Threatened for three consecutive years, there is cause for concern. Wildlife Diversity staff will evaluate the data and provide recommendations for an appropriate response.

Post-delisting monitoring

Pennsylvania's post-delisting monitoring plan is modified from the federal post-delisting monitoring plan for the peregrine falcon (U.S. Fish and Wildlife Service 2003).

A. Monitoring. Annual monitoring will be conducted for ten years following the year in which the peregrine falcon is delisted in Pennsylvania, at the nest sites described below. As before, monitoring will be done by agency staff and local volunteers. Data will be collected at each site to determine nest site occupancy, nesting activity, fledging success, productivity and post-fledging mortality, especially during the 1-month period after fledging.

Nest sites that will be monitored will include:

1. All cliff nests that are active in the year of delisting, or that subsequently become active during the 10-year post-delisting period;
2. The three high-profile building nests identified above; and
3. Fifty percent of the remaining nests on man-made structures that are active in the year of delisting. Sites will be chosen to be representative of the man-made nests throughout Pennsylvania in geographic location and nest site characteristics (e.g. large bridges, small bridges, buildings, smokestacks, etc.). The same nests will be monitored each year during the monitoring period. If new nesting sites become active during the post-delisting monitoring period, 50% of them, selected according to the same guidelines, will be monitored; and if a nesting pair relocates to a new site, that pair and its successors will continue to be monitored at the new location.

B. Nest visits. Nest site visits to verify nesting results and band nestlings will be continued, only at the University of Pittsburgh Cathedral of Learning in Pittsburgh, the Rachel Carson State Office Building in Harrisburg, and City Hall in Philadelphia.

Re-listing Consideration

In accordance with U.S. Fish and Wildlife Service recommendations (U.S. Fish and Wildlife

Service 2003), the population will be considered in decline if, for 3 consecutive years during the 10-year monitoring period, any of the following metrics are observed,, compared with the parameter values during the year of delisting:

1. 12.5% decline in nest site occupancy (excluding documented relocations);
2. 12.5% decline in nesting success; or
3. decline in productivity to below 1.5 young produced per occupied nest.

Wildlife Diversity staff will evaluate the monitoring results to determine whether or not the results suggest that a more detailed analysis of the status of peregrine falcons, the monitoring protocol, or both, is necessary. If any of the three measures of population health detailed above decline below the trigger level for three consecutive years, it will prompt an evaluation and recommendations for an appropriate response by the Pennsylvania Game Commission, in consultation with national and regional experts, as necessary.

SECTION V. PARTNERSHIPS FOR MONITORING, PROTECTING, AND EDUCATING THE PUBLIC ABOUT PEREGRINE FALCONS AND THEIR HABITATS

Developing and maintaining partnerships is important to the successful implementation of this management plan. The success of the peregrine recovery so far has been the result of diverse partners' efforts. Continuing these partnerships is critical to further population improvements. Partnerships with a wide variety of property owners and managers, policy makers, project managers, not to mention state and federal agencies and other interested parties have been particularly beneficial. Important aid has been provided by additional partners: rehabilitators, academic institutions and educational organizations (APPENDIX D. Stakeholders and Partners). The value of the contributions of over 180 volunteer nest monitors throughout Pennsylvania cannot be overemphasized.

Within in the Game Commission, most parts of the agency have a part to play in peregrine falcon recovery. Wildlife Management – Diversity monitors and evaluates changes in the population, trying to anticipate problems and maximize recovery potential. Wildlife Habitat Management –

Environmental Review works with project managers and developers to avoid or minimize human disturbance near nests. Information and Education works to teach the public the unique value of peregrines and how to enjoy the birds without harming them. Wildlife Protection – works to enforce legal protections when educational and other efforts fail, enforcing the protection afforded species Endangered in Pennsylvania and Protected by federal and state laws.

GLOSSARY

- altricial:** Describes young birds that hatch undeveloped and in many cases naked or with sparse down; such helpless young require complete parental care.
- avicide:** Chemical agent used to kill birds, typically pest species (e.g. pigeons).*
- banding:** A method of permanently marking a bird by placing an individually numbered metal ring around the lower leg.
- breast:** In birds, part of the lower (ventral) surface of the body, between the throat and belly.
- breeding season:** The period of time during the year when a particular species may breed.
- breeding success:** Rearing at least one nestling to fledging age, see **fledgling**.
- brooding:** Sitting on hatched young, or sheltering them under the wings, primarily to keep them warm, but also to protect them from sun, rain, or predators. Occurs either in the nest, or outside the nest in those species whose young leave the nest shortly after hatching.
- clutch:** A complete set of eggs; those laid in an uninterrupted series, for a single nesting, by one female.
- clutch size:** The number of eggs in a given clutch.
- Convention on International Trade in Endangered Species (CITES):** International agreement to which 150 nations voluntarily subscribe that binds participating parties to monitor, regulate, or prohibit the import and export of species that the group has deemed worthy of global protection. The species are listed in three Appendices: Appendix I lists the most endangered species, for which all commercial trade is prohibited, Appendix II lists species that would be in immediate danger if trade were not regulated, and Appendix III lists species added by individual countries that are requesting international help in regulating their trade.
- DDE:** A stable, persistent, toxic organic compound (1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethylene) formed in the body by the metabolism of the organic pesticide **DDT** (see separate entry). DDE accumulates in fatty tissues and is excreted very slowly, and when concentrations become high it can cause death or other toxic effects such as reproductive failure resulting from eggshell thinning (due to the disruption of calcium metabolism). Thin eggshells severely decreased reproductive success in North American raptors in the 1950s and 1960s, causing populations of most raptor species to plummet.
- DDT:** An organic pesticide (dichloro-diphenyl-trichloroethane) used commonly in the United States from the mid-1940s to the early 1970s to control Mexican boll weevils, gypsy moths, mosquitoes, and other insect pests. DDT is highly persistent in the environment and is taken in by organisms and converted to DDE, a toxic compound that accumulates in fatty tissues and is excreted very slowly. DDT was banned in the United States in 1972, but is still used in other countries, including Argentina, Belize, Ecuador, Guyana, Peru, and Mexico. See **DDE** for more information.
- delist(ing):** The process of removing a species from a state or federal endangered species list due to successful recovery, see **Endangered Species Act (ESA)**.
- egg:** 1. The ovum; the female reproductive cell sometimes called the egg cell, both before and just after it is fertilized by a sperm cell. 2. The hard-shelled structure laid by birds, containing the embryo, yolk, and white.
- egg tooth:** A short, pointed, calcareous structure on the tip of the upper beak (and sometimes

the lower beak as well) that develops in bird embryos shortly before hatching; the embryo rubs and pounds the egg tooth against the inner wall of the eggshell to break it open and hatch. The egg tooth sloughs off or is resorbed by the growing chick within a few days after hatching.

Endangered Species Act (ESA): Federal law passed in the United States in 1973 that commits the government to take action to prevent the extinction of native species and to protect their habitat. It also establishes a procedure to develop a list of threatened and endangered species, identify their critical habitat, and develop and carry out Recovery Plans.

Endangered, in Pennsylvania: All species and subspecies of wildlife which have been declared by:

- (1) the Secretary of the United States Department of the Interior to be threatened with extinction and appear on the Endangered Species List or the Native Endangered Species List published in the Federal Register; or
- (2) the director to be threatened with extinction and appear on the Pennsylvania Endangered Species List published in the Pennsylvania Bulletin.*

eyries: Falcon-specific term for nest site. For peregrines in Pennsylvania historically: cliffs.*

fledging: Term commonly used to describe the time at which nestlings that are reared in the nest leave the nest, even though their flight abilities may not yet be well developed. But, the term is sometimes used to describe the time at which a young bird has finished acquiring its first complete set of flight feathers—generally the time at which it is capable of flight. The term is used less often in precocial species that leave the nest shortly after hatching, but sometimes it refers to the time at which they begin to fly. “Fledging” may also be used to refer to the process of reaching the moment of fledging.

fledging period: The period of time from hatching to the moment of **fledging** .

fledgling: A young bird that has recently fledged (see **fledging**).

geographic range: The geographic area within which a species or population generally remains at a particular time of year; a species may have different breeding and nonbreeding ranges. Also called the **range**.

habitat: The physical surroundings in which an organism lives. It consists of physical factors, such as light, temperature, and moisture, as well as living organisms, such as plants and animals. Habitats are often characterized by a dominant plant type or physical feature, such as a grassland habitat or stream habitat.

habitat conservation plan (HCP): A plan that must be submitted to the U. S. Fish and Wildlife Service by anyone who applies for a permit to destroy endangered species or their habitats (as allowed under a 1982 amendment to the Endangered Species Act). The plan must specify the steps that the applicant will take to minimize the number of individuals killed and to minimize the impact on the species as a whole, and also must explain why other alternatives are not feasible.

habitat fragmentation: The process by which a large, continuous habitat is broken into a number of small, isolated patches by activities such as development, logging, or farming.

hacking: The technique of introducing young, captive-raised birds of prey, especially falcons, to appropriate habitat by releasing them from an enclosure that serves as an artificial nest and in which biologists continue to place food until the bird has learned to

hunt on its own.

hatching: Emerging from the egg. A clutch may hatch synchronously (all at about the same time: **synchronous hatching**) or asynchronously (over a period of several days: **asynchronous hatching**).

hatchling: A newly hatched animal.

HCP: See **habitat conservation plan**.

incubation: The process by which animals that lay external eggs keep those eggs at the proper temperature for embryonic development until they hatch (or the nest fails). Only birds, crocodiles, pythons, and monotremes (egg-laying mammals) incubate their eggs. In most cases, birds sit on their eggs to keep them warm, but many megapodes bury them—in piles of decaying vegetation, in long tunnels or broad pits where the earth is warmed from nearby hot streams or volcanic cinder fields, or in pits or burrows where bare sand or soil is heated by the sun. In very hot environments incubation may require cooling the eggs by shading them, burying them in sand, or keeping them moist.

incubation period: The time from the start of regular, uninterrupted incubation to hatching.

International Union for the Conservation of Nature (IUCN): International nongovernmental organization based in Switzerland and devoted to the conservation of species. In 1963, the IUCN drafted the original text of the **Convention on International Trade in Endangered Species**, also known as **CITES**, which was ratified in 1975.

juvenile: A young bird.

malar stripe: A distinctively colored stripe in the malar region of birds; also called a **mustache stripe** or **whisker stripe**.

mustache stripe: A distinctively colored stripe in the malar region of birds; also called a **malar stripe** or **whisker stripe**.

migration (migratory): The regular movement of all or part of a population to and from an area; usually refers to seasonal journeys to and from breeding grounds or feeding areas.

nest: In avian biology, a structure built, excavated, or taken over by a bird, in which the eggs are laid and remain until they hatch. In many species, the young remain in the nest until they are able to fly. In some species, the “nest” is simply a scrape or depression on the ground. See specific nest types, such as **cup nest**, for more information.

nesting attempt: An attempt to breed, whether or not the attempt is successful. See also **breeding success**.*

nesting pair: A male and female that occupy a nest site and attempt to breed, whether or not the attempt is successful. See **breeding success**.*

nesting success: See **breeding success**.*

nest box: Structure added to improve site for nesting. See **Appendix C**.*

nestling(s): Young in the nest before their development reaches the fledgling stage. See **fledglings**.*

occupied nest: A nest site that is occupied by a nesting pair; hence, the term is often used interchangeably with **nesting pair**.*

oölogy: The study of birds' eggs.

organochloride pesticide contamination: See **DDE** and **DDT**.

pair: Male and female engaged in territorial and breeding behavior.*

population: All the individuals of a species that live in the same area.

population ecology: The study of how animal populations are related to, and respond to, their environments. It involves monitoring and studying reproductive rates, survival rates, movements of individuals and populations, and changes in population densities over time and from one area to another.

population viability analysis (PVA): A technique developed by conservation biologists in the 1980s that simulates the growth of populations over time. Given numerous demographic variables, such as birth and death rates at various ages and the annual variation in these rates, PVA can predict the probability that local populations of different sizes will go extinct over a designated period of time. The simplest PVAs are **single-population models**, which focus on just one population and ignore any dispersal of individuals between populations. More complex PVAs focus at the **metapopulation** level (see separate entry); these use more detailed information, such as dispersal rates and patterns of behavior and mortality while moving across inhospitable habitats.

prey: Food items.*

productivity: The total number of young fledged or raised to the age of fledging in a defined population or area, divided by the number of nesting pairs (or occupied nests) in the population or area, including unsuccessful as well as successful pairs or nests.*

range: The geographic area within which a species or population generally remains at a particular time of the year; a species may have different breeding and nonbreeding ranges. Also called the **geographic range**.

raptors: Members of the orders Falconiformes, Accipitriformes and Strigiformes, which contain all the diurnal and nocturnal birds of prey.*

recovery: See **Endangered Species Act (ESA)***

reintroduction: The establishment of individuals of a species (through human effort) in an area where that species used to live—using individuals from a different area (**translocation**) or from a captive breeding program.

residents: Individuals that live year round in a particular area.

scientific method: A procedure that scientists use to investigate how the world works. The specific steps typically followed by scientists to investigate aspects of the world vary among the different scientific disciplines, but in the biological sciences the scientific method usually involves the following: asking a question about the world, formulating the question into a testable hypothesis, designing a study and collecting unbiased data, analyzing the data to see if the hypothesis is supported or rejected (this often involves **statistical testing**—see separate entry), and then drawing conclusions.

sexual dimorphism: A situation in which males and females of the same species differ from each other in size or form.

shorebirds: Oystercatchers, plovers, snipes, sandpipers, curlews, phalaropes, and sheathbills. Ornithologists in Britain and the British Commonwealth, except Canada, speak of shorebirds as “waders.”

site fidelity: Loyalty shown by birds or other organisms to places they previously occupied; the places may be breeding locations, nonbreeding locations, or stopover points between the two. Also called **site tenacity**.

subadult: A bird that has not yet reached maturity; immature.

subadult plumage: Any of the plumages worn by young birds before they reach their

definitive plumages (those of a mature bird).

subspecies: A subset of a species, usually in a particular geographic area, that contains individuals that are morphologically distinct from other individuals of the same species, but are still capable of interbreeding with those other individuals. Also called a **race**.

success: See **breeding success**.

survival rate: 1. The proportion of individuals in a population that survive for a particular interval of time—usually a year. 2. The chance that a particular individual will survive a given period of time, usually one year. For example, an adult Royal Albatross has an **annual survival rate** of 95 percent.

tarsus: The upper section of the avian foot, between the heel and the toes.

territorial pair: A male and female that defend a potential nesting territory during the nesting season, whether or not they exhibit any other evidence of nesting such as egg-laying.*

Threatened: See **Endangered Species Act (ESA)**.

Threatened, in Pennsylvania: All species and subspecies of wildlife which have been declared by:

- (1) the Secretary of the United States Department of the Interior to be in such small numbers throughout their range that they may become endangered if their environment worsens and appear on a Threatened Species List published in the Federal Register; or
- (2) the director to be in such small numbers throughout their range that they may become endangered if their environment worsens and appear on the Pennsylvania Threatened Species List published in the Pennsylvania Bulletin.*

tibiotarsus: Bone supporting the lower leg (crus) of birds; the tibiotarsus is formed by the fusion of the tibia with the proximal tarsal (ankle) bones.

translocation: Establishing individuals of a species in an area in which that species formerly lived by importing individuals from a different area.

trophic levels: The different levels of food production or consumption within a food chain or web; for example, producers, primary consumers, secondary consumers, and decomposers.

waterfowl: Ducks, geese, and swans; family Anatidae.

Selected terms used in the Pennsylvania peregrine falcon management plan, excerpted from the Handbook of Bird Biology. The complete glossary is available at www.birds.cornell.edu/homestudy/studentinfo/images/HSCGlossary.pdf.

* Definitions provided by the authors of this Management Plan but not found in Handbook of Bird Biology.

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Birds of North America, Inc.

Appendix A. Historic peregrine falcon breeding locations, listed by county.

County	Name	Location	Quadrangle	Last year	Breeding evidence
Bradford	Wysox	No Details Given	Towanda	1940	Young
	Canton	S Of Bradley Wales Pk. E Side Of Cr, 2 M S Cant	Canton	1937	Young
	Wyalusing	Opposite Wyalusing And 5 Miles South	Laceyville	>1939	Eggs
	Towanda B	Near Towanda	Towanda	1941	Young
Bucks	Uhlertown	Tinicum Township	Frenchtown	1915	Pair
	Kintnersvi	"The Narrows", 12 Mi. S. Of Easton		1941	Young
Carbon	Lehigh Gap	Palmerton On Lehigh River, Nest On Devils Pulpit	Riegelsville	1912	Eggs
	Lehigh Gorge	Above Mauch Chunk	Palmerton	1944	Young
Centre	Bellefonte	Unknown, Site Known To Craigheads			
Clinton	Salona	No Specifics; On Bald Eagle Mt	Mill Hall	1938	Pair
	Hyner	Below Hyner On North Side Of River	Renova E	1939	Pair
	Grove Run	No Details		1895	Eggs
	High Rocks Farransville	Below Falls Of Mcelhat Run; 1 Mile S Of Mcelhatt 5 M NW Of Lock Haven - Never Confirmed	Lock Haven Farransville	1929	Eggs None
Columbia	Catawissa	'AT TOWN'	Catawissa	1940	Pair
Dauphin	Dauphin	Dauphin Narrows, On Peters Mountain	Duncannon	1940	Young
	Millersburg	Between Millersburg And Paxton	Millersburg	1940	Pair
Huntingdon	Spruce Creek	Opposite Tunnel Across Juniata River	Spruce Ck	1936	Young
	Huntingdon	Never Confirmed	Huntingdon	1928	Pair
	Mapleton	No Details	Mt Union	1921	Young
Lackawanna	Scranton	On 2 Large Cliffs E Of Town	Scranton	1939	Pair
Lancaster	Chickies Rock	N. Of Columbia	Columbia W		Pair
	Columbia	Not Precisely Known; Same As Chickies? (Pos York Co.)	Columbia E	1841	Young
Luzerne	Towberry Knob	W Nanticoke	Nanticoke	1930	Pair
	Pond Hill Sta	2.25 Miles N. Of Town, Faces SW	Luzerne	1941	Young
	Wapwallopen	N Of Town, Cliff Faces West	Berwick	1940	Young
	Shickshinny	Opposite Town Of Shickshinny	Shickshinny	1941	Young
	Campbell Ledge Campbell Ledge	Pittston Township, Local Name: Mt Eagle Above Pittston Facing SW	Pittston Pittston	1941	Young
Lycoming	Montgomery	W Side Of River 4 Miles South Of Montgomery	Montoursv S	1938	
	Loyalsock	At Loyalsock Creek; At Sandy Bottom Above Hellsagro	Montoursv S	1932	Young
Northampton	Del Water Gap	Minsi Cliff, Faces Se	Stroudsburg	1941	Young
Northumberland	Fishers Ferry	S Of Fishers Ferry On E Bank Of Susq R. S Of	Pillow	1938	Present
	Danville	'A Few Miles Upstream Of Sunbury'	Northumberland	1938	Young
Philadelphia	City Hall	On The City Hall Tower	Philadelphia		
Pike	Milford	S. Of Milford, N. Of Dingman's Ferry	Milford	1940	Young
Snyder	Northumberland	Shikellamy State Park	Northumberland		
Tioga	Leonard Harris	Two Cliffs Opposite Look-Out On West Side	Tiadaghton	1938	Young
Wayne	Hawks Nest	4 M NW Of Hancock, Faces E On Delaware River	Starruca		
Westmoreland	Jacobs Creek	2.5 M Above Jacobs Creek	Smithton	1914	Pair
Wyoming	Skinners Eddy	Cliff 1 Mile Long	Laceyville	1940	Young
	Tunkhannock	Between Falls And Skinners Below Town On N. Side	Tunkhannock		
	Mehoopany	E Of Mehoopany Facing North	Meshoppeny	1938	Young
	Laceyville	North Of Skinners Eddy	Laceyville	1939	Young

Appendix B. Fledgling peregrine falcons produced in Pennsylvania by nest site, 2001-2011.

When fledglings were not produced but peregrine activity was seen the specifics are indicated by letters; E – eggs, NP - nesting pair, P - pair present, but no nesting attempt, S - single adult, SP - sub-adult pair present, uncertainty of activity is indicated with “?”. Nesting on the NJ side of the state line is placed in [square brackets] and excluded from the breeding activity summary.

Locations	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Allentown, 8 th St. Bridge							NP	4	4	3	4
Ben Franklin Bridge		0	S	S		4	1	3	3	2	4
Brunner Island PPL plant										2	2
Clark’s Ferry Bridge										3	4
Columbia Rte.462 Bridge							E	E	E	2	2
Commodore Barry Bridge	1				[E]	P	P	2	1	3	E
Delaware Water Gap			SP	NP					0	NP	E
Erie, Penelec stack											NP
Etna, 62nd St. Bridge							E				
Exelon Eddystone Power Station											NP
French Creek State Park											3
Girard Point Bridge	2	4	3	3	1	4	3	2	4	2	E
Harrisburg, Rachel Carson	4	4	4	3	3	5	4	4	5	2	1
Luzerne County cliff							0	2	3	2	3
Manayunk, St. John											2
Martin’s Creek PPL plant					2	3	3	4	3	2	4
McElhattan Bridge								2	4	4	4
McKees Rocks Bridge								E	3	2	E
Monaca, E. Rochester Bridge							2	4	3	NP	4
Montgomery Cliff			1	0	1	1	0	2	4	1	NP
Montour PPL plant							1	4	3	2	1
Norman Wood Bridge									NP	P	E
PA/NJ Turnpike Bridge	2	2	3	4	2	3	3	4	4	3	3
Philadelphia: City Hall		S	S	S					4		4
Wachovia Bldg.										2	
Bell Atlantic	1										
Schuylkill Exp.					3	NP	NP				
Pittsburgh, Gulf Tower	4	4	4	4	3	5	4	2	2	5	5
Pittsburgh, U. Pitt. Cathedral	P	4	4	4	3	3	4	3	4	5	4
Pittston/Duryea: Bridge		4	3	3			4	3			
Campbell’s Ledge					2	3			2	3	1
Reading, downtown							1	3	4	3	2
Safe Harbor RR Bridge										NP	
Scudder Falls Bridge								1	3	3	2
Shikellamy cliff							NP	1	NP		
Tarentum Bridge										NP	S
TMI, Middletown		1	3	2	3	3	2	2	1	2	3
Wade Bridge, I-81 Harrisburg										E	
Walt Whitman Bridge	3	[3]	4	3	[4]	[1]	[4]	4	[2]	[3]	3
Westinghouse Bridge							S			3	3
Wilkes-Barre	1	4	2	2	3	2	3	4	4	NP	NP

Breeding activity summary	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Nesting pairs	9	9	11	11	11	13	21	23	25	30	32
Successful nests	8	8	10	9	11	11	13	21	21	23	23
Percent successful nests (%)	89	89	91	82	100	85	62	91	84	79	72
Fledglings produced	18	27	31	29	26	36	35	60	68	61	68
Fledglings per occupied nest	2	3	2.8	2.6	2.4	2.8	1.7	2.6	2.7	2.1	2.1
Nestlings lost				2	0	1	5	1	2	3	2
Fledgling mortality, pre-	4	2	1	2	4	1	3	5	6	7	5
Fledgling mortality, post-		1	3	1	0	2	3	0	3	0	0

Appendix C. Peregrine falcon nest box design.

(From the Raptor Resource Project 2012, www.raptorresource.org)



A nest box designed by the Raptor Resource Project. Construction plans are available online at www.raptorresource.org/pdf/standard_mount_doc.pdf.

APPENDIX D. Stakeholders and Partners. Establishing the mission, goals, and objectives for Pennsylvania peregrine falcon management plan.

Stakeholders from a number of interests were invited to an all-day meeting to discuss what they value about Pennsylvania's Peregrine Falcons. The input of bird, conservation, professional, and sportsmen's organizations, as well as government agencies and Private Land Conservation Partners, helped establish the mission, goals, objectives and strategies of the plan.

Stakeholders invited to initial meeting

Audubon Pennsylvania	The Wildlife Society – PA Chapter
Hawk Migration Association of North America	PA DCNR
Hawk Mountain Sanctuary	PA DEP
Pennsylvania Society for Ornithology	PA Fish Commission
Pennsylvania Falconry and Hawk Trust	U.S.D.A. – National Park Service
Appalachian Audubon	U.S. Department of Defense
Lancaster County Bird Club	U.S. Fish and Wildlife Service
Lycoming Audubon	PA Federation of Sportsmen's Club
Pennsylvania Wildlife Federation	Unified Sportsmen of Pennsylvania
PA Wildlife Rehabilitators	Governor's Sportsmen's Advisory Council
Western Pennsylvania Conservancy	Aqua America
National Aviary at Pittsburgh	PPL – Holtwood and Susquehanna
Pennsylvania Biological Survey – Ornithological Technical Committee	Local, County, and State Regulatory Interests
Pennsylvania Environmental Professionals (PAEP)	County Commissioners Assoc. of PA
Pennsylvania Environmental Education Association	County Conservation District Assoc. State Assoc. of Township Supervisors

Partners critical to the ongoing recovery of peregrines

Delaware River Port Authority (DRPA)
Pennsylvania Department of Conservation and Natural Resources (DCNR)
Pennsylvania Department of Environmental Protection (DEP)
Pennsylvania Department of Transportation (PennDOT)
Pennsylvania Fish and Boat Commission (PFBC)
Pennsylvania Turnpike Commission (PTC)
PPL Corporation (PPL)
US Fish & Wildlife Service (USFWS)
Volunteer nest monitors

The Ark Wildlife Rehabilitation and Education Center, Chalfont
Academy of Natural Sciences of Philadelphia
Carbon County Environmental Education Center
Comcast Center, Philadelphia
Delaware River Joint Toll Bridge Commission, Phillipsburg, NJ (DRJTBC)
Delaware Valley Raptor Center, Milford
Delaware Water Gap National Recreation Area
Federal Highway Administration (FHWA)
Gulf Tower, Pittsburgh; Make a Wish Foundation, Pittsburgh
The National Aviary, Pittsburgh
New Jersey Division of Fish, Game, and Wildlife
Packer Ave. Marine Terminal, Philadelphia
Philadelphia City Hall
Philadelphia Zoo
Pocono Wildlife Rehabilitation and Education Center, Stroudsburg
Red Creek Wildlife Center, Schuylkill Haven
Ritz-Carlton Hotel, Philadelphia
Schuylkill Center for Environmental Education - Wildlife Division, Philadelphia

Three Rivers Avian Center, Brooks, West Virginia
Tri-State Bird Rescue & Research, Newark, Delaware
University of Pittsburgh
US Army Corps of Engineers
Western Pennsylvania Conservancy, Pittsburgh

APPENDIX E. Summary of Public Comments

A draft version of this management plan was made available for public comment from April 29 to May 29, 2013 (30-day comment period). A news release and posting on the Game Commission's web page announced the public comment period. The document was available electronically through the Game Commission's web page, or in printed format by request. Comments could be submitted via e-mail, or in writing to the agency's Harrisburg Office.

Forty-nine correspondences were received. Three were identical duplicates of comments previously submitted by the same individuals and therefore excluded from further analyses. One hundred four comments were identified from the distinct 46 correspondences. For example, a correspondence that stated, "I support the peregrine management plan, but would like to see more educational material available and more wildlife rehabilitators in PA" would be divided into 3 comments: one each supporting the management plan, more education material and more wildlife rehabilitators. Twenty-six topics were identified from the 104 comments. The number of comments received for each topic is noted below, along with the management plan goal or strategies most related to the topic.

Comment Topics	Number received	Goal/strategies most related to topic
1. Support the Game Commission's peregrine falcon management plan	25	none
2. Increase nesting on natural cliff sites	14	2.1.2, 2.3.2, 2.6.2, 2.6.3
3. Minimize human-peregrine conflicts to reduce impact of the peregrine population	9	2.1.1, 2.3.1, 2.3.2, 2.3.3, 2.3.4
4. Delisting or the consequences of delisting may be detrimental to peregrines	8	1.5.1, 1.5.2, 1.5.3
5. Supported the 25% valuation of urban fledgling contribution to the population	6	goal 1
6. Continue visual evaluations of nestling health to intervene and improve survivorship	6	1.3.2, 2.4.1, 2.4.2, 2.5.1
7. PennDot provided comments that need to be addressed on a site specific basis at their project level	6	2.3.1
8. Urban fledglings contribute less to the population than fledglings from cliff sites	4	goal 1
9. Take of peregrines for falconry should not be allowed at this time	3	3.3
10. Peregrines should already be delisted	2	none
11. Cliff nesting is not advantageous to peregrines	2	none
12. Increase peregrine falcon education material	2	3.1.1, 3.2.1,
13. Take of peregrines for falconry should not be tied to delisting resident birds	2	3.3 1.1.1, 1.1.2, 1.2.1, 1.2.2,
14. Did not understand how population was calculated	2	1.4.1
15. Should include migrant falcons in Pennsylvania population estimate	2	1.1.1, 1.1.2, 1.2.1, 1.2.2, 1.4.1
16. Improve website	1	3.1.1
17. Need more raptor rehabilitators	1	2.5.1
18. Use tax payer funds to protect peregrines in all environments	1	none
19. Peregrines are dependent on humans for nest sites, similar to other human tolerant species	1	none
20. Concerned with multiple sub-species used for reintroductions	1	none

APPENDIX E. Summary of Public comments, continued

Comments Topics	Number received	Goal/strategies most related to topic
21. A wide ranging species may not be appropriately considered Endangered within a state's boundary	1	none
22. Urban fledglings in difficult situations should be placed with falconers to mature safely	1	none
23. Enforcement of fines or legal action against those person(s) who bring harm to the peregrine falcon	1	none
24. Provide guidance to hikers in areas with nesting peregrines	1	none
25. Peregrines seen in southern Erie County	1	none
26. Peregrines seen between Lewisburg and Mifflinburg in February	1	none