CURRENT STATUS: In Pennsylvania, the bald eagle is threatened and protected under the Game and Wildlife Code. Although not listed as endangered or threatened at the federal level, the bald eagle is protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Protection Treaty Act.

POPULATION TREND: The recovery of the bald eagle (*Haliaeetus leucocephalus*) has been one of the great wildlife conservation stories in the history of both the state and the nation. Pennsylvania's nesting bald eagle population has increased steadily and dramatically in recent years. As recently as 1980, the state's known nesting population numbered only three pairs. In 1990, there were eight active nests, 48 in 2000, and by 2006 the number cleared 100 for the first time since DDT decimated Pennsylvania's nesting bald eagle population in the 1950s and '60s. The increases continued into 2008 when the state's nesting eagles numbered more than 150 pairs, more than 200 pairs in 2011, and more than 270 pairs in 2013. The exponential increase in Pennsylvania's nesting bald eagle population is part of a regional increase and similar increases are taking place in Chesapeake Bay and New York populations.

The bald eagle recovery was fueled by the Game Commission's eagle reintroduction program from 1983-89. Conditions were right for the project because population limitations including the harmful effects of pesticides on eagle reproduction, poor stream water quality, the lack of trees along many streams, and, in some cases, direct persecution had subsided by that time. The success of bald eagles in Pennsylvania is directly related to improvements in environmental quality; eagles are dependent on good water and riparian forest quality and subsequent fish availability. The bald eagle's recovery is a victory for the Endangered Species Act and much more.

The bald eagle was removed from the federal Endangered Species list in 2007. Its Pennsylvania status was changed to Protected in January 2014 based on data from 2008 to 2013. Criteria for removing the bald eagle from the state's threatened species list are laid out in the Game Commission's bald eagle management plan. The plan called for delisting eagles as threatened if four criteria were met for five consecutive years. There had to be at least 150 active nests statewide, successful pairs in at least 40 counties, at least a 60 percent success rate for known nests, and productivity of at least 1.2 eaglets fledged per successful nest. In 2008 through 2013 Pennsylvania's bald eagles exceeded all of these criteria with 171 to 274 known nests, in 46 to 58 counties, with success rates of 74 to 92 percent for known nests, and productivity of 1.3 to 1.8 eaglets fledged per successful nest.

Upgraded conservation status does not leave bald eagles vulnerable. They are still protected under three federal acts: the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the Lacey Act. We expect further increases and continued expansion in the bald eagle nesting population although expansion may begin to slow down as the best available habitat is occupied. The bald eagle's future in the commonwealth remains as secure and bright than ever.

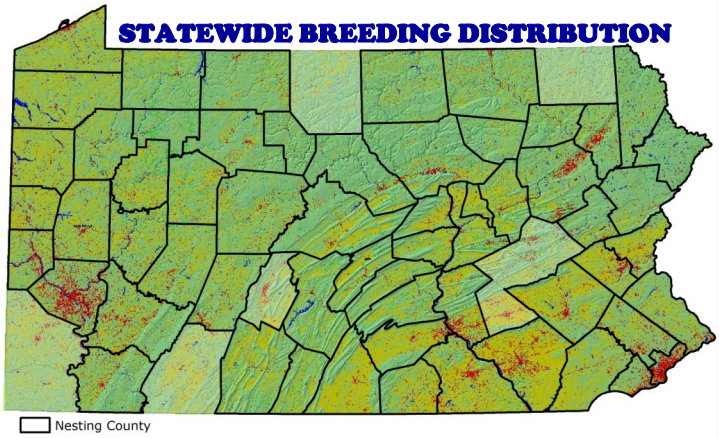
IDENTIFYING CHARACTERISTICS: Bald eagles are among the largest birds of prey. They may weigh up to 14 pounds and have seven-foot wingspans. Like most raptors, female bald eagles are larger than males. Bald eagles are most readily identified by their white heads and tails, however, they don't attain this characteristic plumage until five years of age. Until that time, they are dark brown with varying amounts of white mottling. Their large, sharp talons are capable of dispatching large prey items and their large beaks are capable of tearing apart carcasses of large mammals that they sometimes scavenge upon. They have broad wings appropriate for both powerful thrust in flight and soaring. Unlike the golden eagle, which is a "booted" eagle, the tarsi of the bald eagle are not feathered. The bald eagle is considered a member of the fish eagle or sea eagle group that includes large eagles such as Steller's sea eagle (*Haliaeetus pelagicus*) of northwestern Asia and the white-tailed eagle (*H. albicolla*) of Eurasia.

Bald eagles fly with slow, powerful wing beats and soar with wings at right angles from the body in a flat plane – giving them the "flying plank" nickname at hawk watches. Bald eagles have a different profile than the golden eagle (*Aquila chrysaetos*). In flight, the bald eagle's head and neck protrude half the length of the tail or more; a golden eagle's head protrudes less than half the length of the tail. The golden eagle's tail protrudes behind the bird about 3 times as much as the head protrudes in front. The bald eagle's massive bill also is a good field mark, yellow in adults. The bald eagle's flight profile is very flat, while the golden has a profile similar to buteo hawks like the red-tailed (*Buteo jamaicensis*) or red-shouldered hawks (*Buteo lineatus*). Bald eagles lack the diagnostic golden hackles that mark a golden eagle of any age or plumage. These eagle species also forage differently. The bald eagle is generally a "sit and wait" predator often perching patiently in a tree and watching for fish to surface, while a golden eagle usually hunts actively from the wing.

NATURAL HISTORY AND BEHAVIOR: Bald eagles are found throughout and only in North America, most often around water where they catch and scavenge fish. During nesting season, fish are a major part of their diet. They supplement their diet with waterfowl, small mammals, turtles and carrion. Bald eagles are notorious for their ability to pirate fish from other piscivorous (fish-eating) birds like ospreys (*Pandion haliaetus*) and common mergansers (*Mergus merganser*), chasing the other bird until it drops the fish. Bald eagles are very efficient foragers that are conservative in their energy expenditure. Although bald eagles will hunt in flight and by wading in water for prey, they generally perch on a tree or snag and wait for their prey to appear. They are opportunistic foragers and take whatever is available, but generally consume fish. Bald eagles also will scavenge dead fish, waterfowl and mammal carcasses, including large herbivores such as deer and livestock. Mammals, birds, and carcasses become a more important part of their diet in winter when fish can be more difficult to find and reach because of water levels or ice-cover.

Eagles don't reach adulthood and begin nesting until age four or five and can live a long life for a bird, up to about 30 years. At least two bald eagles in Pennsylvania, a nesting pair, are at least 25 years old. Bald eagles are known for their spectacular courtship, including acrobatic flight displays. The "cartwheel display" is perhaps the best known. In this courtship act, the pair flies to great altitude, lock their talons in flight, and tumble in cartwheels back toward the earth, breaking off their hold at last moment before

colliding with the ground. These flight displays often occur in winter, giving support to the idea that many pairs remain bonded through the year. In Pennsylvania, some pairs seem to occupy the same areas all year long, while others leave their nesting area when ice forms on the water and decreases their ability to find fish.



Cathy Haffner/PGC Map

Bald eagles build among the largest nests of all birds, a massive and often conspicuous structure that is reused and refurbished each year. Nests are almost always near water, including islands, riparian woods, hillsides and swamps. The only nests on cliffs in Pennsylvania are actually supported by trees that grow on the side of the cliff. Eagle nests, called an eyrie, are a huge pile of interconnecting sticks, rubbish, and cornstalks that support a cup of softer materials such as small twigs, grasses, mosses, weeds, sod and feathers. Sprigs of greenery, especially conifer branches, are often found in nests and can be delivered to the nest during the incubation or nestling periods. Typically, these stick nests are 5 to 6 feet (1.5 – 1.8 meters) in diameter, 2.5 to 4 feet (0.7 – 1.2 meters) deep and conform to the shape of the tree where they are built, the shape ranging from cylindrical to conical to flat. Some nests famously have reached huge dimensions including one in Ohio that was 9 feet in diameter and 12 feet high, weighting about two metric tons, that was used for 34 years. Adults will continue using and seasonally adding material to the same nest for years. With damage by storms and rambunctious eaglets, nests often need extensive repairs each year. Eagles will lay eggs in February through April, sometimes sitting on eggs when there is ice and snow on the ground. This is one of the reasons why it is not good to approach nests too closely. If you flush an adult off of a nest in the incubation period you can expose the eggs to cold air, causing nest failure.

Bald eagles normally produce one to three young per year. One pair in Northampton County produced a record four young in 2009, an extremely rare event. A good way to determine that eagles are incubating is to notice when an eagle sits quietly on the nest for long periods, sometimes hours, at a time. Hatching can be inferred when the sitting adult seems to sit higher on the nest contents.

Pairs bonds tend to last more than one year, but although bald eagles are generally believed to generally bond for life, this is poorly studied because of the difficulties in capturing and marking each bird. (Pennsylvania's population is largely unmarked.) The persistence of pairs at sites from year to year, sometimes for decades, suggests long-term pair bonds. However, it is possible that pair bonds can break up after nesting failures. When one of the pair dies, the remaining eagle often seems to find a mate and retains the same territory.


Hal Korber/PGC Photo

Nest-building generally begins one to three months before egg-laying. In some cases, it seems that pairs build or start to build a nest a year previous to egg-laying. Both sexes contribute to nest-building, but the female may place the sticks in place. Sticks are collected from the ground near the nest tree or broken off from nearby trees. Eagles sometimes use a previously built raptor nest as a base for building their own nest. Pairs sometimes build an alternative nest in their territory that they use

some years. The alternative nest may be in a location quite different from the original nest (on a hillside rather than an island, for instance).
Bald eagles generally rebuild or refit their old nest each year. The normal time for this activity in this area is December through February, but they may begin nest repair earlier in the fall or when the nest is in use. In Pennsylvania, most egg sets are laid between mid-February and mid-March, with early March as the peak period. Eggs commonly hatch in April and the young fledge by the end of June or in July.

Bald eagles generally have a clutch of one to three eggs with two the most common clutch size. One egg is laid per day, but not always in successive days, with the clutch completed in three to six days. The eggs are large (averaging 130 grams) and dull white in color with no markings. Incubation begins with the first egg, so the young hatch out over a series of days. Both adults have brood patches, but that of the female is better developed than the male presumably because she does more brooding. The incubation period is generally 35 days in length, but there is some variation. Hatching, like egg-laying, occurs over several days, with one to four days between hatchings. This leads to differences in size between the nestlings and consequential advantage in competition for food, a source of mortality of young nestlings if food is not readily available. Flight feathers emerge in two to three weeks and body contour feathers emerge along the upper wing in three to four weeks. Eaglets gain a lot of weight daily with a maximum average gain of 102 grams per day and 130 grams per day by males and females, respectively. They achieve maximum growth in three to four weeks. Competition between nestlings may lead to starvation or violent death of younger, smaller eaglets caused by their larger nest mates. Nest success can be affected by bad weather and water conditions that make it difficult for the adults to find and capture fish.

Some nest departures are unsuccessful, so eaglets are sometimes grounded near the nest for weeks before gaining flight ability, making them vulnerable to predators or accidents. Adults feed them, but not always successfully if the eaglets are caught in vegetation outside the nest. Young leave the nest about 8 to 14 weeks after hatching, depending on many factors. The adults may encourage fledging by circling the nest with food items. Humans may cause pre-mature and unsuccessful fledging by climbing to the nest or advancing to the bottom or the supporting tree. The juveniles continue to grow and develop after fledging and are cared for by the adults for four to 10 weeks after leaving the nest. The fledglings often follow the adults after leaving the nest site, but often stay fairly close to the nest area (less than 1,000 feet) during the post-fledging period.

Although we tend to focus on the nesting population of bald eagles, many eagles migrate through the state or spend the winter here. The migration population can be divided into two parts: eagles that nest in the southern United States that migrate north after nesting season in winter to spend time in the northern part of their range, including Pennsylvania; and northern eagles that migrate from Canada and northern states through Pennsylvania to the south and return north each spring to their nesting grounds. Southern eagles generally account for the eagles observed between August and September, their migration continuing into November. This migration peaks in mid-September in our state. Many Florida subadult bald eagles migrate north through Pennsylvania and other northeastern states each spring and then migrate south in late summer and fall. Northern eagles that migrate South in autumn generally migrate later in the season, accounting for most bald eagles observed in Pennsylvania in November and Decem-

ber. Raptors, including eagles, migrating late in the fall and early winter tend to use terrain-derived uplifts and migrate close to topographic features that generate that lift, such as the ridge-tops and escarpment edges. Raptors that migrate in such conditions are probably more at risk from collisions with wind turbines and other structures built in these areas. Bald eagles tend to follow deflection currents along ridges and escarpments and our larger rivers where they can hunt for fish. By contrast, the eastern population of golden eagle follows leading lines and diversion lines along ridges and edges of the plateaus in the Appalachian Mountains. Bald eagles are attracted to open water even during migration.


Karen Laubenstein/USFW Photo

HABITAT AND RANGE: Bald eagles are widely distributed in North America, especially where there is expansive aquatic habitat. Bald eagles thrive around bodies of water where adequate food exists and human disturbance is limited. They need a large tree or other supporting structure for their large, heavy stick nests. Bald eagles tend to select quality riparian forest and wetlands for their nesting habitat. As such, it can be considered an indicator species for this habitat and an "umbrella species" for protecting the valuable riverside forests and wetlands of the state, because they get more public recognition and support for conservation than many of the other inhabitants of these habitats. These habitats are important for a variety of wildlife from small cerulean warblers (*Dendroica cerulea*) that nest in tall trees to wood ducks (*Aix sponsa*) that nest in hollow trees along the river bank and American bitterns (*Botaurus lentiginosus*) that nest in large wetlands. Our perception of conditions that bald eagles will tolerate or with which they can be successful continues to change. Indeed, bald eagles are teaching us about eagle habitat as they continue to colonize parts of the state where they have been absent for many decades. More pairs are nesting closer to civilization, so long as their basic nest site and foraging requirements are met and their nest area is not disturbed.

Today, thanks to recovery efforts, bald eagles are nesting across the state and in places where they have not nested in decades, if not centuries. Bald eagles are increasing not only in number, but also in geographical coverage of the state. As of the summer of 2009, bald eagles nested in 46 of the state's 67 counties, and those nests have fledged more than 1,000 eaglets since the mid 1980s. Counties with the most nests were Crawford, Pike, Lancaster and York. Non-breeding adults and sub-adults may be found throughout the state at any time of year. In winter, dozens of eagles are typically found along the Delaware River between Matamoras and Hancock, N.Y., and along the Lackawaxen River in Pike and Wayne counties. Other concentration points include the lower Susquehanna River – south of Harrisburg – and Pymatuning Reservoir in Crawford County. Ice cover often is the limiting factor for bald eagle winter distribution. There are some winter roosting sites in Pennsylvania now that the population has increased to the point where eagles can congregate near good feeding areas. Some of these roosts are in agricultural areas near large bodies of water.

Nesting eagles are particularly sensitive to human intrusions or disturbances, but more eagles are nesting near communities and activity areas than ever before. Eagles may forage a mile or two from a nest, but tend to be very efficient hunters that do not wander far from good foraging opportunities where they

nest. When they feel threatened, eagles will leave a nest, exposing young to harsh weather or to predators, causing nest failure. Eaglets sometimes fledge prematurely from human interference and subsequently suffer injury or mortality. These and other human activities can cause eagles to abandon a nest.

REASONS FOR BEING THREATENED: Like other raptors, bald eagles were persecuted by shooting and trapping from to colonization of the state through the early twentieth century, reducing their numbers greatly and their range to the wildest parts of the state. Direct persecution of eagles has been a serious limiting factor for this species in Pennsylvania up until the early 1940s, when they were federally protected. Despite its status as a national symbol, the bald eagle has been one of most persecuted birds in the county. Early publications accused bald eagles of preying upon game and farm animals and they were routinely shot on sight. Even respected ornithologists and naturalists voiced their negative assessments of the character and value of eagles.

Bald eagles forage for fish and other aquatic life, so water pollution made many areas of the state – and continent – unsuitable for eagles. Since eagles depend on good fish populations, the water quality of rivers and lakes is paramount for its existence. In addition, many former nesting sites have been lost to human development and encroachment. It is good to remember that Pennsylvania was developed first along its rivers, which provided transportation, a source of power, relatively easy development and good soil for farming. So, much eagle habitat was compromised early as this state was colonized and its population grew. Timbering also eliminated many good nesting sites because eagles generally nest in large trees. But the primary reason for the eagle's decline over the last century was the effect of the pesticide DDT and its derivatives on eagle reproduction. It accumulated in eagles and caused their eggs to be too thin to withstand the eagle's weight during incubation. As a result, the bald eagle population plummeted. In 1972, the use of this DDT and other harmful pesticides that bio-accumulated in birds was banned in the United States. The drastic decline of bald eagles and other birds eventually bottomed out. Clean water regulations and heightened environmental awareness during this period also contributed to better fish populations and spurred the recovery on.

MANAGEMENT PROGRAMS: The Game Commission annually monitors bald eagle nests – both existing and new – to measure nesting population trends and nesting success. Monitoring helps the agency to continue to follow bald eagle's recovery and let's biologists know immediately problems are occurring, both locally and statewide. Wildlife Conservation Officers protect nests and work with landowners to ensure the safety of bald eagles and their future success. When discovered, new nest sites are protected and production is monitored. The new management plan for bald eagles also calls for more public education about eagles. This expanded and updated bald eagle account is part of the agency's outreach program. An informed public guided by good "eagle etiquette" will be the best advocate for a continued bald eagle recovery and the best chance that any Pennsylvanian can see a bald eagle near his or her home in the future.

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