

Bald Eagle Nesting Ecology and Phenology

While not every Bald Eagle pair in every region of the country nests in exactly the same habitat or with exactly the same timing (phenology), there are some general traits that are common to typical Bald Eagle territories and nest sites. Any animal, be it mammal, amphibian, reptile, insect or bird, has four basic needs: food, water, shelter and a place to raise young. Within those general needs each animal has specific requirements that vary widely by species and even sometimes by individual. Like many other animals, eagles establish and defend a territory around their nests.

This territory is typically circular or nearly so and is the space that each pair claims as their personal resource. Eagles will actively defend their territories from any perceived threat. While defense of the nest from direct predation is important, territory defense is more about food than it is about safety. Having a reliable and readily available food source is crucial to the success of a nest and the size and location of a territory is intimately tied to food resources available. Therefore, the pair will chase off other eagles, osprey, red-tailed hawks and other such competitors. An average territory is about 1 mile in diameter though in areas where food is harder to find territories may be larger and in areas where food is especially abundant, such as along the Upper Mississippi River, territories may be much smaller.

*Nest sites

Bald Eagles typically raise their young in giant stick nests placed near the top of tall (super canopy) trees near (within about a mile of) a water source. Therefore a typical Bald Eagle nesting landscape would be forested and include rivers or lakes that offer areas of shallow water suitable for foraging. In many cases Bald Eagles also need some degree of insulation and isolation from human activity, though sensitivity to disturbance seems to vary widely (see Nest Etiquette article). A good example of typical Bald Eagle habitat is the forested banks of the Upper Mississippi River; another is the forested peninsula between Lake Barkley and Kentucky Lake, called Land Between the Lakes National Recreation Area, in western Kentucky. These landscapes provide for all four basic needs though the water body (water to drink and fish to eat) and the forest (the trees provide shelter and a place to raise young as well as perches for hunting and resting). As a note, in areas where trees are few and far between eagles will nest on the ground or on the tops of cliffs!

Bald Eagles usually like to have a clear view in all directions around their nests and so tend to prefer nest sites that are on some sort of edge, be it water or forest opening, and that have a variety of tree heights. Nest trees tend to be the tallest in the surrounding area, called super-canopy trees. Nests tend to be very large and rather heavy, so the best nest trees are tall, strong healthy trees. Pairs that are building a new nest usually choose a living tree as the base for their nest though there are often some dead trees, called snags, nearby that serve as lookout posts. Eagles reuse their nests year after year, especially if the parents successfully raise young from that nest. The birds will keep adding to the nest every year, cleaning out debris from the previous year, making repairs, and expanding so that very old nests can become enormous, up to nine feet across and 12 feet high! Typical nests are much smaller, more like five or six feet across and three or four feet high, which is still a rather large nest! One well-

known nest in Ohio was used for 34 years! The foundation of a new nest is usually a significant branch, often a forked branch, four meters or more from the top of the tree. The nest itself needs to be higher than the surrounding vegetation to provide both easy access and a clear view of possible threats to the nest. The trees that are tall and strong enough to satisfy eagle nesting needs tend to be old and sometimes may be nearing the end of their life. Occasionally the nest tree dies but stays strong for a time and the eagles will continue to use their nest, despite the death of the nest tree, often until the tree/nest falls down. As a summary, tree shape, size and location are more important to an eagle looking to build a new nest than is the tree species, but some of the trees more likely to meet nesting needs are pines, spruces, firs, oaks, hickories and cottonwoods. In Iowa a large percentage of eagle nests are placed in cottonwood trees, as these trees tend to grow to an ideal size and shape and are associated with lowland areas near water sources.

Sometimes a territory includes multiple suitable nest sites and a pair may build more than one nest within a territory. While a territory can only have one ACTIVE nest at a time it can certainly have alternate, inactive nests. Research dating to the late 1980s found that the average number of nests per pair was greater than one (1.5) with up to five nests reported in some territories! Sometimes a pair will use one nest consistently year after year; sometimes they'll alternate, using one nest one year and the other the next. In other cases the eagles may use one nest for several years and then use the other for awhile before returning to the first nest. There does seem to be some link between nest success or failure and the desire to move house; if a nest is successful there is a better chance that the pair will nest there again the next year than if it fails. If the nest fails the pair may look to try a different location the next year, turning to an alternate nest within their territory. In some cases the pair may give up on the territory all together and move on to a different place, leaving the nest or nests within that territory vacant until another pair decide to move in. Sometimes a nest or territory can be inactive for 3 or more years before hosting nesting eagles again. Eagles are very opportunistic creatures and tend to take advantage of the resources available. Therefore, a useable nest probably will not stay vacant forever. This opportunistic behavior coupled with the creation of alternate nests means it is important not to forget about vacant nests, because you never know when they will become active again. Interestingly, inactive Bald Eagle nests sometimes host other bird species, such as Great-horned Owls or even Canada Geese!

*Foraging locations:

Most eagles feed primarily on fish and waterfowl, so easy access to a food source is key. Raising young eagles is hard work: the little guys need a lot of food! Placing a nest near a food source means the parents do not have to waste valuable time and energy flying to a food source and looking for food. It is important to note that while eagles are good hunters, they would much rather scavenge or steal a meal than hunt one themselves (again, that energy conservation thing) and if the opportunity for a "free" meal exists they'll take it. Because of this opportunistic behavior eagles are not bound to nest near a water source (though most do). For example, in recent years bald eagles have begun to nest near livestock operations, a long distance from any significant water source, where livestock waste provides a ready food supply.

*Perch Sites

Along with one or more appropriate nest sites, a bald eagle territory also needs several quality daytime perch sites. Perches are used for resting, for monitoring their territories for threats (predators, other eagles, etc) and for hunting. Several scientific studies on bald eagle perch use have determined favored perch trees are larger (DBH) and taller with longer trunks than non-perch trees. Perch trees also tend to be dead and dying and within 20 meters of shoreline, though the life status of the tree (dead, dying or alive) appears to be of less importance than tree height and proximity to water. Also of note is an apparent tendency to select coniferous trees for perching during times when deciduous trees are in leaf and a preference for deciduous perches before leaf out and after leaf drop.

*Phenology

The entire cycle, from egg laying to fledging, tends to take about 18 weeks (or 4.5 months) though it can vary a bit depending on how many eggs are laid and how many days pass until a clutch is complete. Eagles generally lay one egg per day and often wait a day before laying a second egg. Nests most commonly have 2 eggs but sometimes have three and it can take up to 6 days to complete a three-egg clutch. At the other end of the process, some eaglets take longer than others to leave the nest and fledging can happen anywhere from 8 to 14 weeks after hatching. Most young fledge between 11 and 12 weeks of age. A parent eagle's job doesn't end at fledging, however, and if the post-fledging care is included in the nesting cycle the length becomes closer to 5.5 or 6 months. Fledglings may continue to rely on their parents for food and other care for 4-6 weeks post fledging.

Nesting behavior in the upper Midwest can start as early as January with some light housekeeping around the nest: clearing out any unwanted debris, fixing any damaged areas of the nest and adding on to the nest. Some resident (non-migratory) pairs may stay in the vicinity of their territory all winter and can be seen poking around the nest year round. The early season work is usually sporadic and not terribly serious. More dedicated repairs start in February. This home improvement behavior serves two purposes: 1) it makes the nest ready to house the next generation of eagle young; 2) it strengthens the bond between mates and is part of the courtship process. A pair that successfully raised young the previous year usually stays together and tries again the next year (if it's not broken, why fix it). These birds don't have to spend time actively searching out and courting a mate though they may still engage in the elaborate courtship displays that "single" birds do.

Courtship displays can be pretty spectacular to watch. The most visually stunning of these displays is the cartwheel display, where the potential mates fly together to a great height, lock talons and tumble end-over-end together. Just when you think they are going to crash into the ground the pair will break apart and fly back up into the air. In the upper Midwest copulation usually occurs in March and is followed soon after by egg-laying, somewhere in mid to late March. Incubation begins after the first egg is laid, meaning that in a nest with more than one egg there will be an oldest sibling, a youngest sibling and occasionally a middle sibling. Both the male and the female incubate the eggs and both have brood patches, though the female tends to do the bulk of the incubating and has a much more developed

brood patch. The brood patch is an area of bare skin on the bird's breast that is formed when the bird removes its own feathers. By removing the feathers the parent bird allows his/her body heat to better reach the eggs and keep them at the proper temperature. Incubating eagles will sit on the nest almost continuously, so the continual presence of an adult on the nest is a good clue that the female has laid eggs. Incubation lasts 35 days with very little deviation. The eaglets hatch from the eggs without any help from the parents. Pipping, as the hatching process is called, can take an entire day. The oldest egg hatches first and its younger sibling follows 1-4 days later. At first it may be difficult to tell when a nest moves from eggs to babies, since the female spends a lot of time brooding the tiny eaglets and this behavior looks very much like incubation. If you can stay and observe the nest for a while, however, you should see the male deliver food to the nest. The female will then tear off small pieces and feed it to the eaglets. You may not be able to see the babies themselves but it will be obvious that the food is disappearing somewhere and that the female is not eating it herself. As the babies grow you should have opportunities to see them poking their heads above the nest rim, especially by about 5-6 weeks of age.

As the young birds grow and develop they literally stretch their wings, testing out their abilities by flapping across the nest and even up onto limbs immediately adjacent to the nest. These behaviors become more frequent and more adventuresome as the young approach fledging. Parents can also provide clues that fledging is approaching. Instead of bringing food directly to the nest the adults may fly above the nest with the prey and call to the eaglets, seemingly bribing the youngsters with food to venture out of the nest. The young will leave the nest about 11 weeks after they hatch. First flights are often rather awkward and up to half of fledging attempts are less than successful. The parents typically continue to feed these grounded birds and eventually they do fly again.

In other regions of the country the timing of the nesting cycle varies a little bit. For example, in Florida nest building/maintenance activities may start in late September or early October and incubation can begin in October. Interestingly, the Florida nesting season tends to be prolonged, meaning that while some birds do start incubating in October, others may wait until April. In Saskatchewan, almost all the nesting pairs lay their eggs in mid-April while in Mexico many pairs are already incubating in January.

Eagle Nesting Phenology in the United States. This table is reproduced from "The National Bald Eagle Management Guidelines", U.S. Fish and Wildlife Service, May 2007.

Chronology of typical reproductive activities of bald eagles in the United States.

Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.
SOUTHEASTERN U.S. (FL, GA, SC, NC, AL, MS, LA, TN, KY, AR, eastern 2 of TX)											
Nest Building											
				Egg Laying/Incubation							
			Hatching/Rearing Young								
					Fledging Young						
CHESAPEAKE BAY REGION (NC, VA, MD, DE, southern 2 of NJ, eastern 2 of PA, panhandle of WV)											
				Nest Building							
					Egg Laying/Incubation						
						Hatching/Rearing Young					
								Fledging Young			
NORTHERN U.S. (ME, NH, MA, RI, CT, NY, northern 2 of NJ, western 2 of PA, OH, WV exc. panhandle, IN, IL, MI, WI, MN, IA, MO, ND, SD, NB, KS, CO, UT)											
				Nest Building							
					Egg Laying/Incubation						
						Hatching/Rearing Young					
								Fledging Young			
PACIFIC REGION (WA, OR, CA, ID, MT, WY, NV)											
				Nest Building							
					Egg Laying/Incubation						
						Hatching/Rearing Young					
								Fledging Young			
SOUTHWESTERN U.S. (AZ, NM, OK panhandle, western 2 of TX)											
				Nest Building							
					Egg Laying/Incubation						
						Hatching/Rearing Young					
								Fledging Young			
ALASKA											
					Nest Building						
							Egg Laying/Incubation				
								Hatching/Rearing Young			
Ing Young										Fledg-	
Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.