



Introduction

There are five types of loons in North America which are all members of the family Gavidae. At BRI, we have worked with red-throated and yellow-billed loons, but our species of primary concern is the common. The common loon, *Gavia immer*, is the only species who breeds within the contiguous United States. Its dappled back and lonesome cry symbolize remoteness and wilderness for many people who live or vacation along the United States' northern tier.

Evolutionary Adaptations

Loons constitute an evolutionarily old order of birds. Although duck or goose-like in appearance, loons' closest relatives are actually penguins and albatross. Their legs are set far back on their bodies, which increases their agility and speed while under-water but prevents them from being able to stand upright or walk on land.

Another physical attribute that distinguishes loons from most birds is their bone structure. While most birds have hollow bones to assist them in flight, the bones of loons are almost solid. This adaptation allows them to dive easier and to greater depths (air filled bones would make them more buoyant). They have been caught in fishing nets over 100 feet deep. There is a trade-off for this heavy bone structure, however. When taking off into flight, loons require a relatively long runway. To clear the water they must run for up to a few hundred yards. On smaller ponds, they often have to circle a number of times before they can gain enough height to clear the tree-line.

Their feather pattern is another adaptation. Both the male and the female have a very characteristic black and white plumage. The dappled back, although extremely visible on land, works well as camouflage in sun speckled water. Also, since loons can control the level at which they float, from fully upright to "snorkeling" with just their nares (nostrils) above water, they can be difficult to spot at times. Although adult loons have no natural predators, their chicks are often picked off by eagles. Keeping a low profile on the water during the breeding season may reduce the risk of chick predation. During the non-breeding months from approximately October to April, their black and white plumage is replaced by a duller gray-brown coat.

Establishing Territory

Early in the spring, adult loons return to their nesting grounds from the ocean where they spent the winter. They often return within hours of ice-out onto the lakes where they have previously bred. This amazing feat is accomplished by a constant series of aerial "reconnaissance flights". As the ice melts on rivers close to the wintering grounds, adults move to these ice free areas, and make short flights up river or to small lakes and ponds to the north which are still iced over. As soon as these water bodies are free of ice they use these ponds or rivers as their new "home base" and continue flyovers further to the north. Thus, loons migrate north with the ice in many small jumps. By doing this, they are able to procure a territory as early as possible, thereby preventing other adults from moving in on their historic nesting grounds. Adult males who have held territories the previous year return first, followed soon after by their female counterparts. Next to arrive are the adults who did not breed the year before, followed at last by the adults who have never held a territory.

During the first few weeks, pairs begin forming a bond, courting, and finally actively defending their territory from other adult loons, as well as many other species of waterfowl. Instances have even been recorded of nesting loons attacking great blue herons and moose in attempts to drive them away from the nest site. Throughout this time unpaired loons try to move in on a pair's territory and break them up, often violently, in order to procure a mate and a territory for themselves. Adult females typically fight with other females and males with other males. Many times throughout the summer, one can see groups of three or more birds diving synchronously and swimming around each other in a "circle dance" on lakes across the northern states and Canada. This dance is a less aggressive way that an intruding loon can evaluate the strength of a pair bond and the fitness of an individual loon. Most times the encounter ends with this dance or a few vocalizations. Sometimes, however, the circle dance can turn violent, with the locking of bills, pummeling of wings, and long chases around the lake where the birds row across the surface of the water with their wings. These confrontations will only end when the territorial adult is driven out of the territory or the intruder decides it isn't worth it . . . for now.

After a pair has secured a territory and formed a tight pair bond, they will mate. To mate, the birds swim over to land and beach themselves, pushing themselves back into the water afterwards. It is common in many bird species for both females and males to mate outside of their pair bond (extra-pair fertilizations and copulations), ranging in frequency from always to rarely. Loons are one of the very rare species where this never occurs. The act of copulation is so time intensive and difficult, leaving the adults vulnerable and visible, it would be nearly impossible for a pair with any sort of bond to mate outside of that pairing without the other mate noticing and driving the intruder away. But this is not to say that a pair mates only once every season. Copulation within the pair may occur several times before egg-laying.

These instances represent one of the very rare situations when loons are on land. The only other times birds can be seen out of the water are when they are incubating eggs, or when they are sick. Oft times when birds are injured, sick, or plagued by internal parasites, they will beach themselves, waiting to heal or to die. Sick birds that drift into defended territories may be driven onto land by the resident pair. Although there have been rare incidents of adults crawling out on land to defecate and even teaching their chicks this behavior, this is not the norm.

Nesting

Once a female has been fertilized, the pair will begin to evaluate nesting habitat. Since adults cannot move about easily on land, and must literally push their bodies about (imagine having to crawl without arms), they must place their nest very close to the water's edge to create easy access and exiting. The nest site is the adult's most vulnerable position, and it is imperative that they be able to launch themselves back into the water at the earliest sign of danger. There are many traits which loons evaluate when looking for a good nest site. Islands are preferred because of their resistance to some forms of nest predation (this is discussed in more detail later). It is also important to find an area which is protected from wind and waves, as well as an area which is covered with vegetation to shade the nest and hide it from potential predators.

There are four types of nest dishes. The "bowl" is a round, dish-shaped structure approximately half a meter (20 inches) in diameter and 15 centimeters high (6 inches). It is usually constructed of soft packed materials (grasses, reeds, mosses, or leaves) on top of a cleared area of shore. The second type of nest is called a "hummock". It is very similar to the bowl, except instead of being constructed on a cleared area of shoreline, the hummock is constructed from below the water level in a shallow area near the shore. Materials are built up from the lake bottom to a height above the water that resembles the bowl. The "scrape" is the third type of nest used by common loons. This is the lazy loon's nest. Instead of building a bowl, the pair merely clears the shoreline and lays the eggs directly on the substrate, whether it's soil, sand, or gravel. Sometimes they go so far as to outline the nest area with a circle or half circle of twigs or small stones to delineate what is nest and what is not, but often they don't even do that.

The type of nest that is built depends largely on both the members of the pair, and the location which they choose to build the nest. Loons, unlike a lot of nest-builders, do not carry materials from far away for construction, but rather use materials that are extremely close by. Both the male and female of the pair nest-build, and during construction it is not uncommon to witness both birds dipping their bills into the water for grasses and reeds which they then dump on the rising dish. Some pairs will even build multiple nests in different location before deciding which spot is the best for eggs (this behavior has been shown to increase as blood-mercury level increases).

There are some decided advantages to nesting so close to the water, such as quick exits, easy entry, and clear visibility of their territory (not to mention, easy spotting by biologists monitoring loon productivity), but there are some disadvantages as well. One is predation. There are many mammalian predators, such as raccoons, which consistently search shoreline for food. Because of this, loon eggs make an easy meal once the adult has been flushed off of the nest. Nesting on islands, when they're available, limits this to some degree. Shoreline nesters also suffer from higher rates of avian predation as well, because of the greater visibility of the nests. Lastly, because the nest is so close to the lake's edge, water fluctuation can cause a nest to fail. If the water level increases from heavy rains or hydro-electric dam fluctuations, the nest will be swamped and the eggs lost. If the increase is only a few centimeters, loons have evolved to overcome it. Often when there are heavy rains, you can watch loons building their nests higher to bring them out of reach of the rising water, rolling the eggs onto successively higher levels of vegetation. However, when the water level rises greatly, as is often the case with dams, there is no way that the loons can keep up, and the nest fails. Water bodies which drop drastically are also detrimental to egg success. Since loons cannot easily push themselves across land, nests which get stranded far from the water's edge are often abandoned by the adults.

At BRI and other organizations which manage for loon populations, we construct floating rafts out of cedar logs. On top of these rafts, which we anchor to the lake bottom with cinder blocks, we add amounts of vegetation suitable for nest-building and shade. Loons which utilize these rafts, the fourth type of nest, are not affected by fluctuating water levels as the rafts float up and down. Predation is also lower from both mammals, because of their island-esque makeup, and birds, because of wire covers which we top with camouflage netting to hide the nest from hungry avian eyes.

It should also be noted that territorial pairs, which are actively defended a territory, may not always attempt to nest. Common loons are a k-selected species. By that I mean that they are extremely long-lived birds which put off relatively few young per year. They may live as long as 30 years. Throughout that whole time they only have to raise one chick which reaches sexual maturity in order to replace themselves before they die. Granted, the rate of egg and chick predation can be very high, but it still is not necessary for a pair to nest every year in order to secure this aim. However, a pair must maintain a territory to hold on to the *option* of nesting in subsequent years. Should an individual get forced out of a territory it could take many years for them to force their way back into one again.

Incubation

As is the case with nest-building, both the male and female participate in incubation. Usually two eggs are laid, approximately a day apart, although laying only one egg is not uncommon. One in 200 nests has three eggs in it. Each adult takes a turn sitting on the eggs for a few hours, leaving to cool down, feed, and defecate. Because of their dark plumage and high metabolism, incubating adults often get hot on sunny summer days. It's common to see adults panting on nests, since they don't sweat, in order to cool down. Should they get too hot, they will slip off into the water.

There are a number of things besides heat that will drive an incubating loon off of a nest: intruding loons, predators, and most importantly on developed lakes, people. In these instances the eggs are normally left uncovered, because the adult or its mate will not return to a nest when there is danger around. Eggs left alone can more easily be predated by mammals and birds. Additionally, should the adult not return to the nest before the eggs have cooled, the developing chicks will probably not make it to hatching. Also, the eggs must be turned periodically to prevent the uneven build-up of gases and to evenly distribute warming. Eggs which are not turned for too long will fail. Usually, under normal circumstances, an adult will turn the eggs when it "relieves" its mate from incubation duty before settling down on the nest.

It should be noted that adults that are flushed off of a nest too often will often decide that the location is not safe enough for them and will abandon the nest. Because of this, should you see a loon nesting, it is best to stay away. When incubating adults notices a threat of some kind, they will usually hang their head and neck low over the edge of the nest to reduce their visibility. If the danger persists or worsens, they will slip off the nest into the water.

Towards the beginning of the incubation period, loons are much more likely to flush at the first sign of alarm. Later, however, they will stick it out longer, since they have more time and energy devoted to the developing chicks. When they are finally flushed during this later period, they are more likely to come off violently, rowing across the water with their wings, vocalizing widely, and even rearing out of the water completely on their hind quarters. These types of behaviors are extremely aggressive, and meant to frighten as well as to threaten intruders.

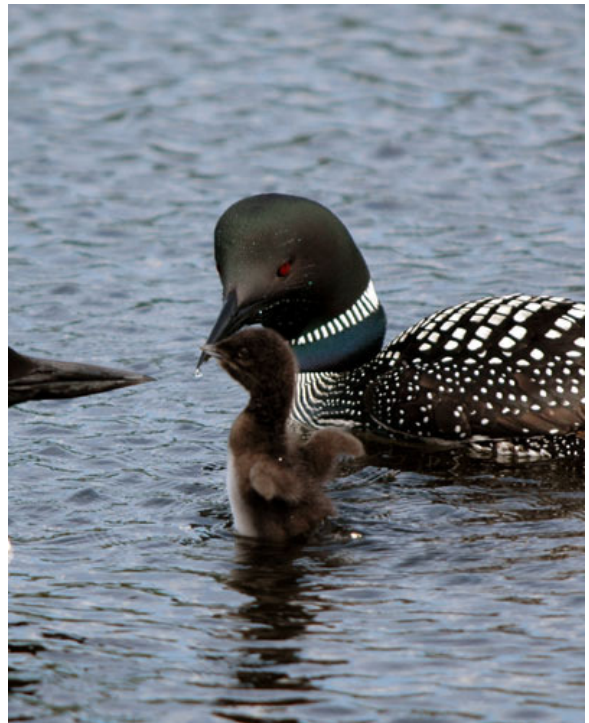
Chicks

After approximately 27 days the incubated eggs hatch. The wet chicks spend a couple of hours on the nest dish drying, and then slip into the water never to return to a nest until they too incubate eggs of their own. Loons, like many birds have an asynchronous hatch. Since they laid the eggs approximately a day apart, the eggs hatch with a similar time difference. Because of this there is a noticeable weight difference between siblings when the pair hatches more than one egg. Siblingicide is common in families of two chicks, as the older, bigger chick asserts dominance in the competition for adult attention and feeding.

This early period of the chicks life is the most dangerous. If they survive sibling rivalry, chicks can be eaten by snapping turtles, eagles, bass, pike, and muskellunge. Since adult loons have no natural predators, it is exceedingly important for the survival of the chicks that adults stay very close to their young. Chicks will often ride on the back of either parent to both avoid predation, and to dry off and rest. As the chicks age beyond two weeks they will rarely if ever attempt to back-ride. Both parents will stay with the chick, however, until the end of the summer, with one parent watching over them, while the other fishes.

Threats to Loons

- Loss of habitat from shoreline development
- Poisoning from lead, usually in the form of lead sinkers
- Poisoning from human-caused mercury in the environment
- Mortality related to marine oil spills
- Mortality related to commercial fish nets



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