# Yellow-throated and Solitary Vireos in Ontario: 3. Nest Building

by
Ross D. James

## Nest Building

Nest building may seem simple enough – just gather materials and put them together. But, in addition to the intricacies of weaving a hanging nest, the activity is linked closely to the reproductive physiology of the birds. The few days of nest building are among the most demanding for a pair of birds of any time in the year. The pair rather suddenly must closely attune its activities not only of building, but also of going through the appropriate courtship activities and displays to culminate in both being reproductively ready to produce fertile eggs. They have to contend with fitting into the activities of a whole community of other species using the same woodland, some of which are potential predators or nest parasites. Building a nest is also an energetically demanding activity.

## The schedule

For a first nest of the year, building in both Yellow-throated (*Vireo flavifrons*) and Solitary Vireos (*V. solitarius*) usually takes about eight days, with the first egg laid on the ninth day after starting. On the first day, there is little more than a start made. The nest is largely put together in five additional days. The seventh day is devoted mainly to courtship and copulation, with the nest as the focal point of the activity. The lining of the nest is completed on the eighth day.

Through the egg laying period, or even during incubation, they occasionally bring a few more bits of material, but nothing substantial is added. Renests, after the loss of eggs or young to a predator, can be done in as little as five days. A pair is no doubt more comfortable with each other and better able to coordinate its activities, as well as being more familiar with its surroundings. Renests, however, may take just as long as a first nest.

Nest building is generally continuous throughout the day from the second to the sixth day. Only inclement weather is likely to stop it. Birds will build almost continuously for several hours with only irregular breaks of 10 to 15 minutes to look for food. But, by the end of the sixth day and on the seventh and eighth, trips may be an hour apart.

## The materials

Materials are gathered locally about the nest area and vary slightly depending upon what is available and the particular pair involved. The most important materials are insect silks and spider webs. These are gathered from tree trunks and branches or bark crevices where cocoons, caterpillar tents and spider webs are found. These fibres bind other materials together as well as providing much of the suspension support for the hanging nest.

The nest is largely composed of

bark strips, although other materials are also used (see Peck and James 1987). The birds cling to or hover beside a trunk and pull off pieces. If a piece is large, the birds land nearby and hold it with one foot while they tear off suitably sized items, letting unwanted parts fall. Several pieces are usually brought in any one trip to the nest. In the main body of the nest, pieces are about 2 to 10 mm wide and 3 to 10 cm long.

Nest lining is of thin pieces of grass or other fine materials they may encounter. To gather grass they typically alight on a branch or stick near the ground, seldom ever hopping on the ground itself. Lining materials can be 15 to 20 cm long at times, being bent to fit into the nest.

Each nest of the Yellow-throated Vireo has added to it a considerable quantity of grayish lichen, of the kind that is typically found growing on the trunks of trees. Even renests usually have many pieces, most clearly visible on the exterior of the nests. It is picked off a trunk as the birds cling to or hover beside a tree. In fact, the lichen is added almost anytime during construction, most of it in the early stages, as if it were just more building material. What appears on the exterior just ends up there because of the way the nest is put together. It is not specifically added as an adornment at the end.

Solitary Vireos use less lichen, and many nests have none at all. Bits of white birch bark and spider egg cases protruding from the exterior provide a mottled appearance to the surface in much the same way lichens do for the Yellow-throated Vireo.

**Nest sites**

Details of placement and sizes of Ontario nests are to be found in Peck and James (1987). Although all Yellow-throated Vireo nests reported from Ontario have been in deciduous trees, pines are often used in the southern parts of their North American range (Imhof 1962). Some very low nests are known (1.3 m), but typically, they average over 10 m high, are more than half the tree height (but below three quarters) and are closer to the centre of the tree than toward the outer branches. Yellow-throated Vireos may occupy forests where Red-eyed Vireos (*V. olivaceus*) are also found, and it appears that they will nest higher in such situations (James 1979, Williamson 1971) probably avoiding conflict/competition with another vireo species. Although foraging tactics of these two vireos are somewhat different (James 1975) they no doubt take some of the same types of food, especially during the nesting season.

In Ontario, Solitary Vireos typically place nests below about 5 m in height, although a few may be over 10 m (Peck and James 1987). They tend to use the tops of small evergreen saplings well below the canopy of taller trees, putting the nest among leafy green parts of the tree. In other provinces/states where Solitary Vireos occupy deciduous dominated forests, they are likely to place the nest near the top of a broad-leaved shrub or sometimes near the ends of a branch of a lower limb in a deciduous understory tree.

**The building process**

As is typical of all vireos, the nest is suspended by the rim from a small forked twig (or possibly from two small twigs arising close together).

Initially some silk or webbing is brought and wrapped rather loosely about the fork. Then bark strips are brought and they are also wrapped about the branch and the ends tucked in amongst the webbing. By the end of the first day, a small accumulation of materials is wrapped about the fork, mostly toward the base of the fork.

The birds then begin to stretch fibres across the fork and to lay bark strips across. When they come with bark, they just drop it in a random fashion on top. Then they again pick an end of material and pull it and tuck it in somewhere or pull it right over and around the branch and tuck it in. Then they take a piece of insect fibre and pull it over and tuck it in. The end they take may be from the top or the bottom of the accumulating material. By alternately pulling and tucking the different materials they develop a very random weave of materials.

The building does not seem to be very systematically done, as bark materials are just dropped, and ends are grabbed and tucked almost anywhere. Silk may even be wrapped about their foot, and it then breaks when they fly away. Yet, the strength of the future nest is no doubt ensured by having everything randomly woven, so long as sufficient material is wrapped around the fork. By the end of the second day, there is a substantial platform of materials (see Figure 1), with a high proportion of insect fibres, very loosely woven about and across the fork. Spider egg cases and/or gray lichens are obvious and, later, naturally end up on the outside of the nest.

After this, little material is added

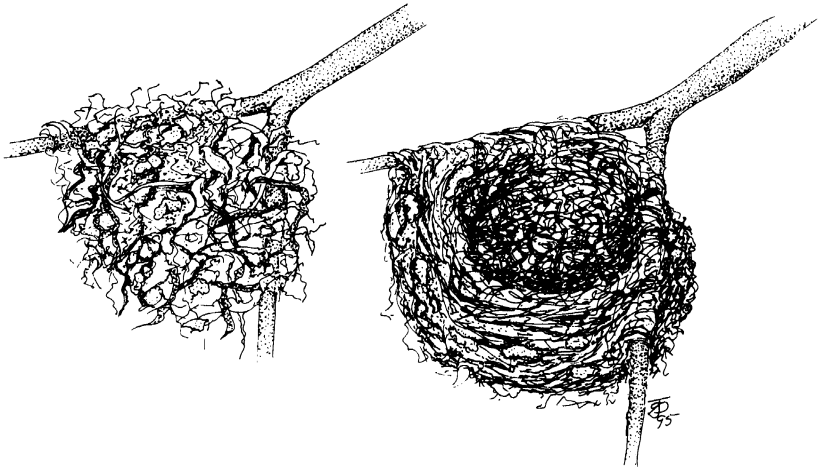

Figure 1: A second and a fourth/fifth day of nest construction. The second day nest (left) is a very loose, nearly flat accumulation of insect fibres, bark strips and lichens. The fourth/fifth day nest is still loose inside, but much tighter on the outside and over the supporting branches, as well as having been pushed down to nearly full size. Drawing by *Ross D. James*.

that will be wrapped about the branches for support of the nest, except at the outer rim that is not supported by a branch. The bulk of the material added on the third and fourth days goes to fill out the bottom and sides of the nest. Large numbers of bark strips are brought and dropped onto the nest and pushed down. By now, the birds can get onto the nest and push with their feet. The elasticity of the insect fibres is essential to holding things without breaking as the nest is expanded.

As the centre of the nest is depressed, the outer rim becomes more prominent. In part, it can be treated as if it were supported by a branch. Material from within or the outside bottom of the nest can be wrapped over it and tucked in on the other side to provide support for the nest bottom and side. But more importantly, it is anchored well to the supporting branches at each side. By stretching fibres diagonally up from the centre to the side supports, the outer rim is lifted and well supported. Although the outer rim will sag below the supporting branches, it is surprisingly strong and durable.

On the fourth day, pushing the nest down and out becomes more vigorous. The birds will spread their wings against the nest rim to hold them as they push. The bottom bulges and springs back as the feet shove against the inside. The seemingly random arrangement of materials, as it is stretched out, provides a fairly tight weave. The materials on the outside become stretched and smoothed compared to the loose interior at this stage. The materials over the forks of the branches also become stretched quite thin or tight against the branch. By the fourth day, the nest has been pushed out almost to full size.

Then, pieces of lining are pushed down into the nest and any protruding piece is bent down and tucked in. The bird gets on and pushes with the feet and sits in the nest, turning about pushing in different directions. Adding the lining pushes the nest to its final size. These longer materials, just bent randomly about the interior, push out because of their own elasticity, helping to hold the nest shape as well as smoothing the interior. Relatively little material is used for lining, but more time is spent arranging it and sitting on it to smooth the interior.

Lining is completed on the final two days, but the addition of materials seems less important than the final shaping of the nest. The female may sit on the nest as long as 15 minutes at a time, appearing to be just resting or becoming familiar with the place that she will spend much of the next two weeks of her life. This probably helps to put a bend into the lining materials so they stay against the sides. She also needs to rest, in preparation for egg laying, that is also energetically demanding.

**The builders**

At the start of the building, the males of both species make as many or more trips with material than do the females. Males are usually the first to get there and do some of the building. The females then supplant males at the nest and build in the materials one or both have brought. Initially, when supplanted, the male stands nearby and gives his nest building display (see James 1978). He may fly off a short distance and gather material while the female

builds, returning to the nest when the female leaves. But, he seldom stays at the nest alone, usually following the female away, and both search for more material together.

Through the second day of building, the female becomes more committed to building and gradually begins to arrive first at the nest. The male will wait until she leaves before coming to build. The female may then return with more material by the time the male has finished with the material he brought.

But the amount of building by the male soon declines. Even on the third day of building, while he continues to come with the female every time, he may come with no material, or just drop it and leave it for the female to build in. The female definitely does most of the building on the fourth and fifth days, although there is considerable variation in how much each male continues to do. On the sixth day, the male has stopped building entirely, leaving the lining to the female.

**Behavioural synchrony**

Once birds are paired, they tend to remain in almost constant contact with one another for the first week or so at least. This tendency seems much stronger in the male. The male almost never flies off leaving the female alone in early nest building, or does not go out of contact call range. But the female often flies off for more nest material, leaving the male at the nest. The male may fly off after her, even taking the nest material he just brought away with him. More usually, he will fly to the nest, drop the material and fly away after her. Sometimes he will fly after her, fly back to the nest and build very briefly and then fly off to find her.

When together, they use contact calls, but if the male is left alone and loses contact with the female, he usually begins to sing loudly and rapidly until he finds the female again. He may remain at the nest, or fly about singing and calling until contact is made. However, by the time the nest is complete, the male becomes considerably more independent again. He does still ordinarily follow his mate closely, but she more frequently flies off alone, without him calling and searching for her.

The nest building display seems to be most important in stimulating the female to build (James 1978). It is given on almost every trip to the nest on the first day, but the frequency wanes rapidly, as does the male's nest building, and as the female's building activity increases. On the second day of building, it is seen on only about one third of the trips to the nest, as many as six times an hour. By the fourth day, it is seen perhaps only once an hour. It is seldom seen on the fifth day and never after that, when the female has assumed all the remaining building activity.

Male song, apart from times he becomes separated from the female, is usually only heard when the pair come to the nest. Even after he is not building any longer, he continues to fly to the nest area with her and to sing while she builds. Away from the nest, contact calls are used predominantly. But then suddenly about the seventh day, there is a resurgence of song associated with courtship. He will sing slowly almost anywhere in the territory and most of the day.

About the fourth day of building, some males will begin to chase females. These are not aggressive

chases; the male never chases until after the female has flown. He then flies close after her until she lands, and he breaks off as if nothing happened. Such chasing is a prominent part of courtship in many species, apparently allowing for a harmless release of aggressive energy that might otherwise interfere with mating synchrony (Marler 1956, Kreig 1971). With some male Yellow-throated Vireos, it can be quite common, but it is virtually never seen with others. Chasing generally seems to be less frequently seen among Solitary Vireos, and not seen at all among most pairs. When it does occur, chasing increases until the seventh day, but seldom persists after that in either species.

At the time of pairing, the male uses a courtship display, but then it is not seen again for several days. About mid nest building on day 3 or 4, it may suddenly appear again. At either of these times, the display may be seen almost anywhere in the territory, but is not very vigorous, is not accompanied by any resurgence of song, and is usually seen only early in the day (or immediately after finding a possible mate). Never have I seen copulation at these times. The display usually disappears again until about the seventh day of building.

Only on the seventh day (rarely late on the sixth or continuing into the early eighth) does a pair finally copulate successfully. This is accompanied by the resurgence of song, but also the male is again seen fluffing his plumage as he did when the birds first paired (see part 2). The fluffing will be maintained through the day and even into the next day. But, now the female may be seen fluffing also, whereas she never did at the time of pairing. The seventh day is the culmination of building and courtship in preparation for the next phase of the nesting cycle. The eighth day seems a day of relative rest.

**Discussion**

The lives of these two species in Ontario are quite parallel through the nest building period. The main points of departure are the heights at which they nest, the type of tree used for nesting, and the amount of lichen on the nest exterior. The use of deciduous trees for nesting by Yellow-throated Vireos, and coniferous trees by Solitary Vireos, is probably largely a function of the type of habitat they occupy. The Yellow-throated Vireo seems quite capable of using pines and the Solitary Vireo of using broad-leaved trees where they occupy different habitats in other parts of their range.

However, nesting at different heights may reflect the avoidance of competition between these two species in an earlier era. Although they are now largely separated by elevational and geographic distributions (James 1979), through a previous long glacial period they might have been pushed into much closer contact. The Yellow-throated Vireo today appears to avoid competition when occupying the same habitats with the morphologically less similar Red-eyed Vireo, by nesting and foraging higher (Williamson 1971, James 1979). Direct competition may now be minimal between Yellow-throated and Solitary Vireos, but their divergent nesting habits persist. To some extent, the Solitary Vireo may also be avoiding competition with the more abundant Red-eyed Vireo, by nesting very

low and in coniferous dominated forests in Ontario.

The Yellow-throated Vireo has apparently had better nesting success with increasing amounts of grayish lichen festooning the exterior of its nests. They now incorporate this as a building material in virtually all nests. In a relatively bright environment, that of the top of a deciduous tree, it may serve well to provide a cryptic coloration to the nest. In the typically more shady environment low in a coniferous dominated woodland, the lichens may be less useful to the Solitary Vireo. The whitish bits of bark and spider egg cases would seem to be more important to this species in providing a nest that is less readily detected by predators.

The close contact maintained between the male and female through the nest building period is characteristic of many songbirds, and probably serves several functions. It has been considered mate guarding, to prevent extra-pair copulations (Howes-Jones 1985), but, that seems a rather weak argument among the sparse populations of these species. In fact, it still occurs in very isolated pairs, and likely is of greater significance in other contexts.

For a while after pairing, the male seems very intent on encouraging the newly arrived mate to stay and nest with him. He devotes a great deal of energy to the nest building display at every opportunity through the first day. Maintaining close contact with the female probably also contributes to establishing a pair bond. Then, as the bond becomes firmer, and the female assumes a greater commitment to nesting, the close attention of the male should assist in synchronising their reproductive capabilities. The pair might well be able to build a complete nest in fewer than eight days, as they usually do when renesting, but the extra time helps ready both physiologically for successful reproduction.

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Ross D. James, Department of Ornithology, Royal Ontario Museum, 100 Queen's Park, Toronto, Ontario M5S 2C6.