

Possible Causes of Brood Reduction in Red-headed Woodpeckers





The Red-headed Woodpecker Recovery project (RhWR) was organized in 2007 and is a 501(c)(3) tax-exempt non-profit organization.

Investigation and research activities about Red-headed Woodpeckers (RHWOs) at Cedar Creek Ecosystem Science Reserve began in 2008 when Cedar Creek ESR gave a permit to the RhWR to initiate those activities on site. The RhWR has continued investigation and research activities since 2008 both at Cedar Creek ESR and at other locations.

Field observation efforts for included information occurred between 2012 and 2025 in all 12 months of the year, with a combined 2,563 days and 15,438 hours by Siah St. Clair and work partner Jim Howitz. All observations were made during a succession of RHWO study and research projects. Many activities required extensive experience and expertise as well as special permits and permissions.

By conducting these observation activities new natural history behaviors of RHWOs have been documented and will be used to help reduce the decline of this species and other species impacted by the presence of RHWOs.

Unless otherwise noted, the information and photographs provided herein are based solely on observations by Siah L St. Clair, a volunteer of the Red-headed Woodpecker Recovery project.



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Observations, Text and Photography by Siah L St. Clair

Brood reduction occurs when fewer nestlings fledge from a nest than the number of eggs present during incubation (clutch size). Brood reduction occurred in nearly every Red-headed Woodpecker (RHWO) nest at Cedar Creek Ecosystem Science Reserve (Cedar creek ESR), 100% of 58 nests where data was collected for brood reduction 2013 through 2015, (B Yohannes Master's Thesis, Dec. 2017, J Howitz 2013). The average eggs produced by RHWOs per nest was 4.8, while the average nestlings that fledged from successful nests was 2.4. So, in RHWOs in these observations, about 50% of eggs incubated became fledglings at Cedar Creek ESR from 2013 through 2015 (56 nests, 278 eggs, 138 fledglings). (Brood reduction should not be confused with nest failure, where all eggs or nestlings are lost, often to known factors, and failure usually happens all at once. Brood reduction usually occurs one by one over several days or weeks.)

The average brood reduction is less in many other species. A quick search finds that Eastern Bluebirds have a success rate of around 78%. Peregrine Falcons have a success rate of fledgling between 70-80 percent. The success rate for Pileated Woodpeckers is lower, around 65%, but still higher than RHWOs. Red-headed woodpeckers do not incubate after the first egg is laid but often begin incubation before the last egg is laid (based on the author's observations of adult behavior before and after putting portholes in nests). So, why is RHWO brood reduction so consistently high in nearly every nest?

The Red-headed Woodpecker Recovery Project set a goal in 2015 to solve this brood reduction mystery. Most guesses by volunteers at the time were that outside forces (e.g. Starlings or Red Squirrels) were the cause of these reductions. But these were guesses, based on anecdotal information and popular beliefs that European Starlings, Red Squirrels, and other outside factors, were often the cause of brood reduction at the nests of many bird species.

Following are several observations made by the author from 2013 to 2025 that may provide possible clues. These observations include picture evidence which documents specific behaviors, or the lack of picture documentation that eliminates some guesses as to cause of brood reduction.

1. There have been no incidents observed of Red Squirrels or European Starlings attempting to enter an active Red-headed Woodpecker nest at Cedar Creek ESR. This statement is based on personal observation and on special nest cameras that I (with some help) placed 3 feet from the nest hole at 28 Red-headed Woodpecker nests with nearly 294,000 hours of surveillance and over 500,000 pictures and videos collected over 6 years. There was no significant difference in nest success at RHWO nests with or without nest cameras.



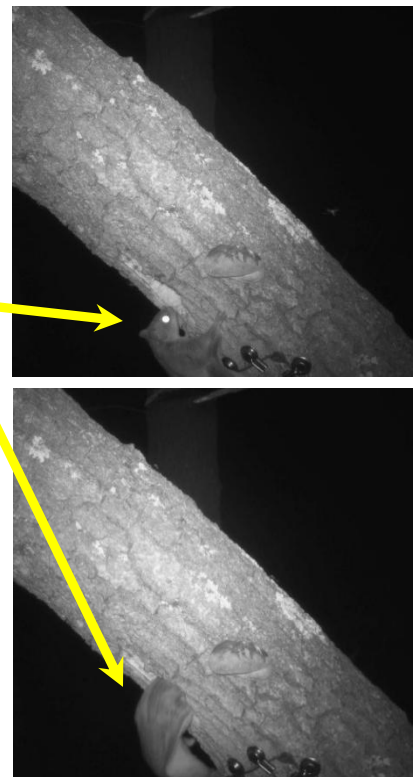
I found no evidence documented in the nest camera videos or pictures that Starlings or Red Squirrels steal eggs at Red-headed Woodpecker active nests. However, I did observe both European Starlings and Red Squirrels nesting and roosting in old Red-headed Woodpecker nest cavities.



2.

Southern Flying Squirrels will usurp some Red-headed Woodpecker active nests from the adult woodpeckers if they are able. This always happens at night when the males are guarding the nest from intruders. If the male disappears due to predation or automobile collision, the nest is left unguarded as I made no observations of a female woodpecker in an active nest at night. Flying squirrels will kill the nestlings or destroy the eggs to take possession of the cavity. But in one instance, while the squirrel killed the other nestlings, one nestling escaped out of the nest and was old enough to survive. It was found the next day and fed by the adult female and lived. So, this nest did not fail but had a brood reduction.

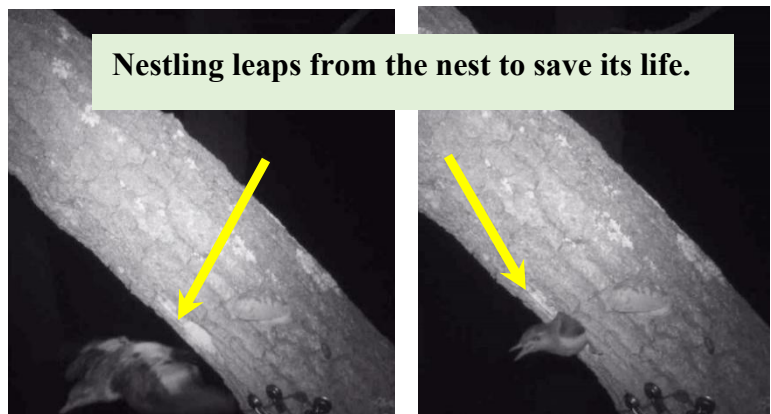
Flying Squirrel enters unguarded nest.



Nestling that survived.



Nestling leaps from the nest to save its life.



3. Sometimes the male woodpecker will remove an egg from the nest if it looks different, rotten, or for some reason unknown. The day after the egg in this picture was removed, the other four eggs in the nest began to hatch and all hatched successfully (as seen during nest camera maintenance). Since the egg had been counted in the total clutch, this would be an example of a brood reduction, caused by the egg being removed by the male adult.



4. Hatchlings or young nestlings die in the nest for unknown reasons. No marks or injuries were found on them. In one out-of-focus picture an adult is seen carrying what looks like a dead hatchling out of the nest. Two days later another dead nestling was found in the nest and removed to see if any indication could be found as to why it had died. I found nothing. This was another observation of brood reduction, two young nestlings dying within a few days of each other for unknown reasons.



Dead hatchling being removed from nest by adult.



Second hatchling found dead in nest of unknown causes. No bite marks were found.

5. In one observation a male removed an egg that had just been laid in the nest. The nestlings from this pair's first nest had just fledged several days earlier. That nest was 3 feet away from this cavity in the same tree. Now the adults had decided to use this cavity for a second nest. The female entered the nest and laid the first egg, and within 90 minutes the male removed that egg. The female laid more eggs over the next few days, all of which were accepted by the male, incubated, hatched (based on nest camera documentation), and three fledged. But why did he remove the first egg? Did he not believe his genes were involved in its production? Another example of brood reduction.



Female entering nest to lay first egg of clutch.



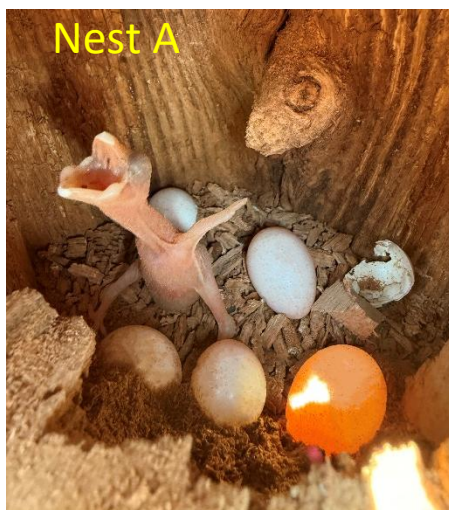
Male removing same egg 86 minutes later.

6. Another form of brood reduction occurred after nestlings had hatched and were a few days old. The adult male entered the nest and removed a remaining unhatched egg while the female was present outside the nest in this picture.

After the first group of nestlings hatch, any eggs remaining are not likely to have any incubation time other than the "brooding" the adults do to keep the nestlings warm. Eggs die as a result.



7. In 2025 some Red-headed Woodpecker nests were reduced to only one nestling, although there had been four to five eggs originally in these nests. These pictures and screen shots from one nest (Nest A) may show a possible cause. Some of the pictures are very low resolution. This certainly shows a possible factor in brood reduction at some nests during this year.



The far-left picture from my pole camera shows five eggs in nest A on June 30. The near left picture was taken as I put in a porthole to nest A on July 7. At this time there was one young hatchling, its eggshell, and four remaining eggs in the nest.



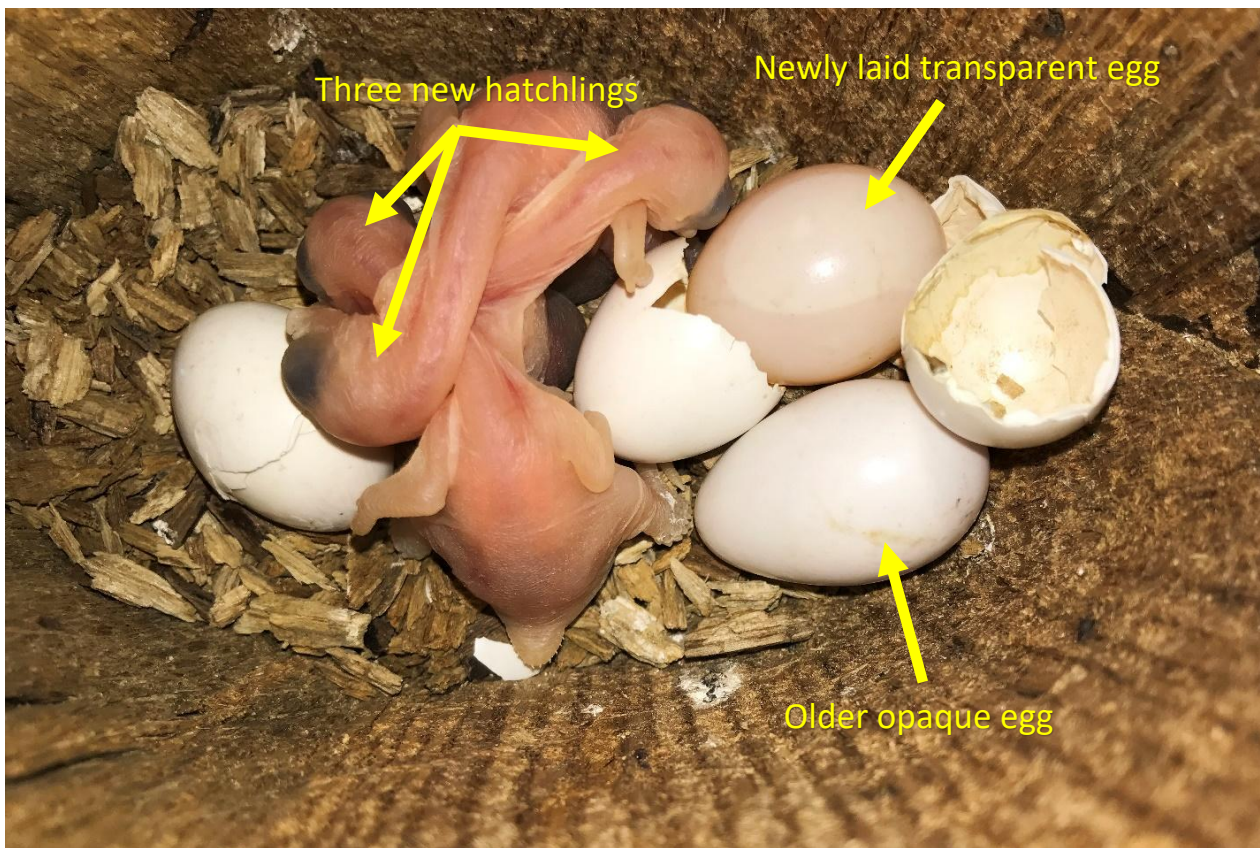
These are two screen shots from nest A's nest camera video on July 8, at 6:01 AM. The video clearly shows the male parent of this nest removing a live, just hatched nestling from the nest. Other new hatchlings were likely also removed but not captured by the camera.



The picture on the far left (A) shows only one nestling on July 22, 2025. The picture on the near left (B) is of a different nest with one nestling from several eggs.

This brood reduction to one nestling apparently occurred at several nests in 2025. This was not observed in previous years, except in 2012, where we found 17 of 47 nests had only one fledgling. Was this behavior influenced by the highest density of Red-headed Woodpeckers on this site the previous year? Or the never before documented all woodpeckers remaining for the winter two years in a row? Or a low food supply in 2025? Questions in need of answers.

8. I have observed that RHWOs may lay what are called “insurance eggs” shortly before their existing incubated eggs are ready to hatch. (I observed this while cutting portholes [more than 70] into active nests with eggs so transmitters can be attached later when the nestlings are big enough.) As I looked into one nest of three just hatched nestlings (<24 hrs) there were two remaining eggs. One was completely white, while the other was pinkish and transparent as the air bubble in the egg could be easily seen. Having observed this many times before, I had learned that recently laid RHWO eggs stay transparent for 24 to 48 hours until they become opaque, and the air bubble can no longer be seen. The transparent egg must have been laid shortly before the three eggs had hatched, possibly in the previous 24 hours. Since the older eggs did hatch, incubation would end within a few days, and the newly laid egg would not survive to hatching without incubation. This is another possible cause of brood reduction.



9. I have also observed that 2–4 day-old hatchlings have already begun the RHWO nestling practice of scatter-spraying their fecal matter all over the bottom of the nest cavity. Any unhatched eggs are quickly covered with this semi-liquid mess. An egg that is covered in this fecal matter may not be able to “breathe,” and it may suffocate and die. In the case of the nest in this photo, there were 7 eggs, 3 of them had hatched, and the four remaining eggs may not have hatched. Three hatchlings fledged, probably the 3 in the picture. It seems, in this case, that this fecal spraying may possibly be a way to keep any other eggs from hatching. As can be seen, the remaining eggs are covered by the spray. It at least shows another possible mechanism of brood reduction.



10. Another possible brood reduction factor may be caused by nestling “stacking” in the nest cavity. If there are three or more nestlings, as they get larger, generally only one is on top to receive food from the parents. If one hatched a day or two after the others, it will be smaller and may not make it to the top of the stack as often as the others and may not survive as a result. When nestlings are taken out to have transmitters placed on them, it is not infrequent to have one be too small, and weigh too little, for the harness to be placed on it. It may have hatched a day or two after the other nestlings, or was less aggressive, and not getting fed as often as the other nestlings. Some of these smaller nestlings were eventually found dead, inside or just outside the nest cavity.



11. Another possible cause of brood reduction occurs when the physical nest is damaged by a storm or dead tree failure, but not all nestlings may perish as a result. An example is this aspen nest tree. During a rain and windstorm, it had broken off at the nest cavity with what remained of the cavity filled with rainwater. A concerned research technician we met on the trail near the damaged nest reported that he could not find any of the 4 nestlings he had recorded earlier. But I found and photographed two nestlings two days later, and I observed two fledglings 11 days later.



Brood reduction may happen in RHWOs for a number of reasons. There are 11 possible examples here, with only two external to RHWO behavior, and both being fairly uncommon: surviving a nest tree disaster and surviving a usurper's deadly intentions. All the other possibilities involve RHWO behavior: Rotten egg removal, insurance eggs, both parents participation in egg making, nestling fecal spray possibly killing remaining eggs, removal of unhatched eggs, unexplained hatchling death, parental removal of live hatchlings, and nestling stacking. These are all documented observations, rather than the undocumented guesses we made several years ago. Some of our guesses about brood reduction have essentially been laid to rest as improbable through many tens of thousands of hours of surveillance without a single occurrence (European Starlings and Red Squirrels). Some of these observations were documented only once, and all need more study.

Possible Brood Reduction Causes and Non-causes

1. Adult male parent removing unhatched eggs
2. Adult male parent removing first laid egg by female. Possibly not fertilized by him.
3. Insurance eggs laid just prior to earlier eggs hatching.
4. Nestlings scatter-spraying fecal matter over remaining eggs.
5. Nestling stacking in nest cavity.
6. Probably not caused by European Starlings or Red Squirrels.
7. Adult male parent removing living hatchling.
8. Usurpation of cavities by Southern Flying Squirrels.
9. Nest tree failure exposes nestlings.
10. Young nestlings dying for unknown reasons.
11. Adult male parent removing defective eggs.