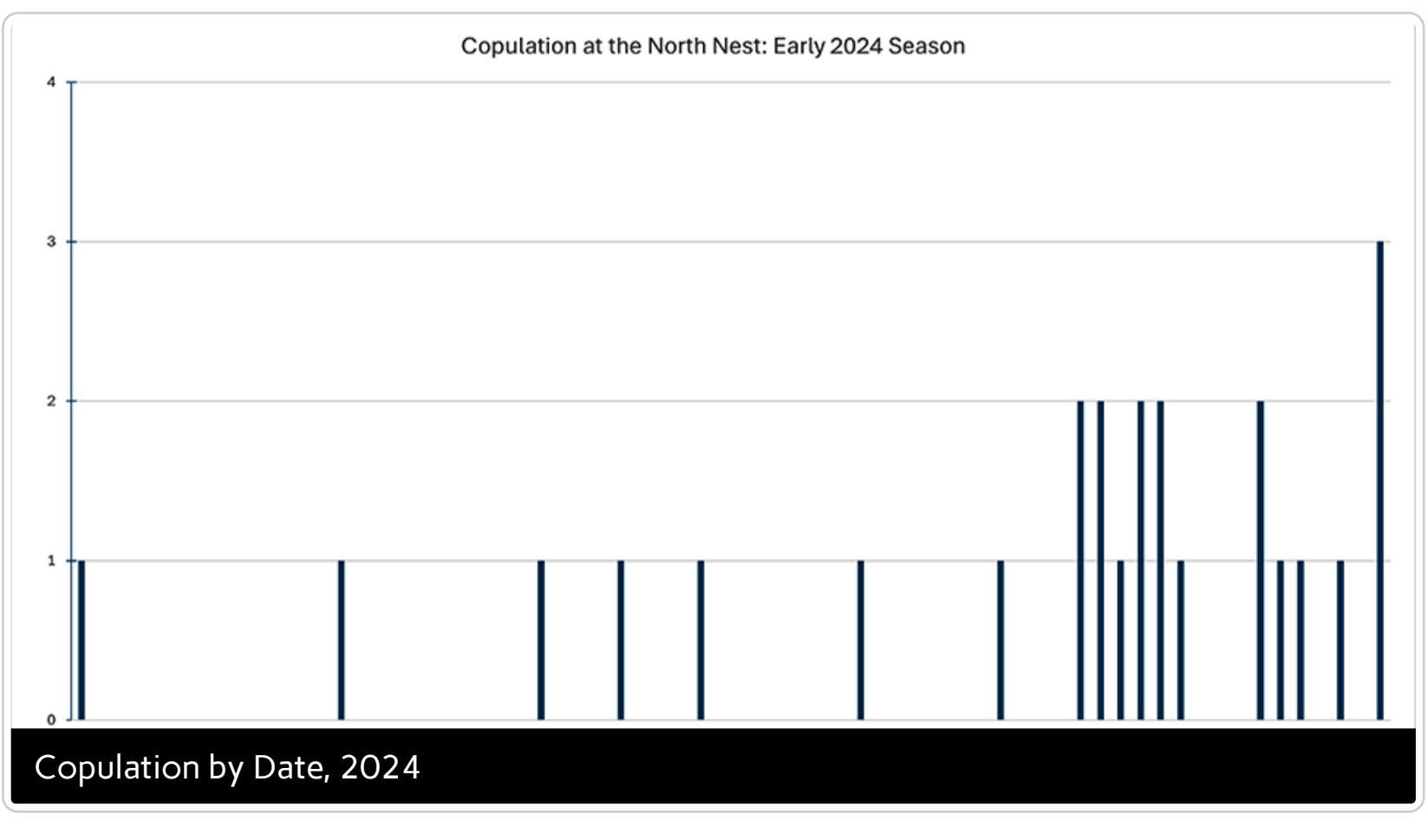
How long does it take a bald eagle to lay an egg?

February 11, 2025 RaptorResource

Tick-tock egg clock! Egg Watch is on!

How long does it take a bald eagle to lay an egg? We think that female bald eagles begin laying eggs five to ten days after productive mating begins. Our eagles tend to lay their first egg about eleven days after copulation goes from casual to frequent… and sometimes *very* determined on the female eagle's part. We've often seen female eagles take the lead – beak-biting and footing their mates, loudly vocalizing their intentions, and mounting them! You don't need to be a male bald eagle to know that they mean business.

Bald eagles ensure fertile eggs by copulating regularly: *something we are starting to see at all of our nests!* DNF and Mr. North – the eagle pair we are able to follow most closely – went from from the occasional afternoon delight to regularly getting their groove on on January 28. We're curious to see what the coming week looks like, especially since egg watch has begun!

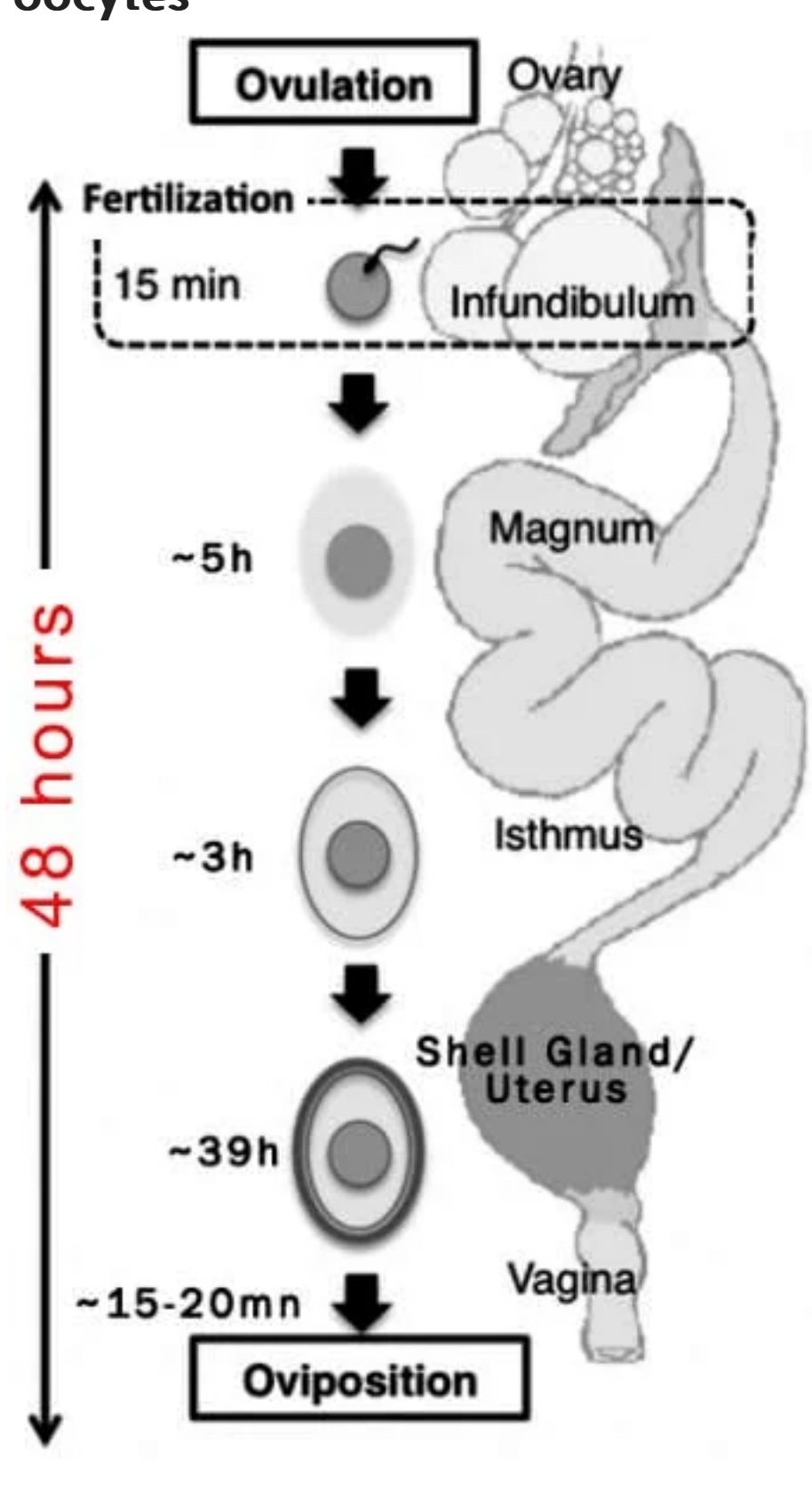


Copulation by Date, 2024

So how long does it take a bald eagle to lay an egg following fertilization? The short answer: we think it takes approximately two days (48-50 hours) based on research done on domestic chickens. Real world times may vary!

Step One: Egg follicles and oocytes

Eggs begin with egg follicles. These specialized pores produce an oocyte or yolk that swells as it matures. The oocyte eventually bursts its follicle and proceeds to the oviduct. At this stage, it is a microscopic blob of cytoplasm and a nucleus that contains the female eagle's genetic material.

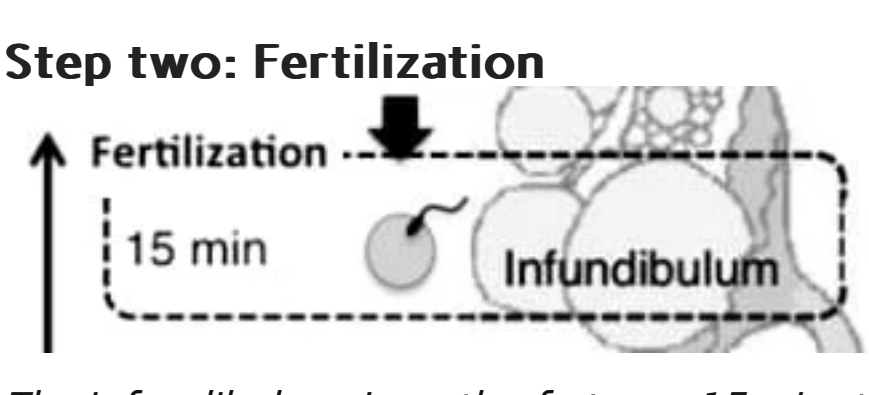


The reproductive system

We think it takes eight to ten days for a bald eagle's oocyte to mature. It takes four to five days in small birds like great tits and white-crowned sparrows, six to eight days in larger birds like ducks and pigeons, and up to 16 days in Emperor Penguins.

How many oocytes do female eagles develop? In domestic hens, each follicular cohort (follicles that will become eggs) numbers six to twelve follicles and follicles are selected roughly every 24 hours. We know that our eagles generally produce at least three each year. Since it takes roughly 48 hours for them to lay an egg, follicle number two must rupture about the time egg number one is laid. Follicle number three experiences a delay of about 48 hours, giving their 'egg-machines' a chance to rest and resupply!

Step two: Fertilization



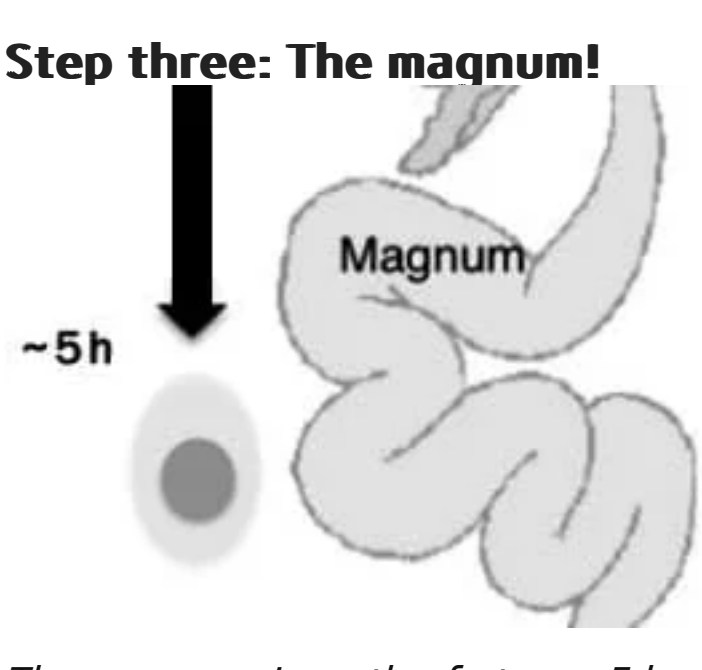
The infundibulum: Length of stay: ~15 minutes (T – 47+ hours)

Only one sperm can fertilize an egg, but hundreds or thousands may be waiting in the oviduct. They have just 15 minutes to fertilize the oocyte before the infundibulum seals it away under an impenetrable layer of protein. The newly fertilized oocyte, now called an ovum, continues its journey through the magnum, dividing and growing as it goes.

At this stage, the ovum consists of the fertilized yolk and surrounding layer of *chalaza*, aka albumen or egg white. The ends of the chalaza twist with other proteins to create two filaments as the egg spirals through the magnum. These filaments will eventually anchor the yolk to the egg's hard calcareous shell, keeping it in place.

Fertilized or not, the egg will proceed down through the eagle's reproductive system. Crack an infertile chicken egg and take a look at the yellow yolk. See the whitish disc? That is the undeveloped nucleus or blastodisc – the hen's genetic contribution to her offspring.

Step three: The magnum!



The magnum. Length of stay: ~5 hours (T – 42.5 hours)

The magnum uses water and proteins absorbed from the female eagle's bloodstream to coat the ovum in a second layer of albumen. This will cushion the embryo and provide much of the protein it needs for its development. Remember the male eagle's food gifts to his mate? Female eagles need all the water, protein, and calcium they can get to produce viable eggs!

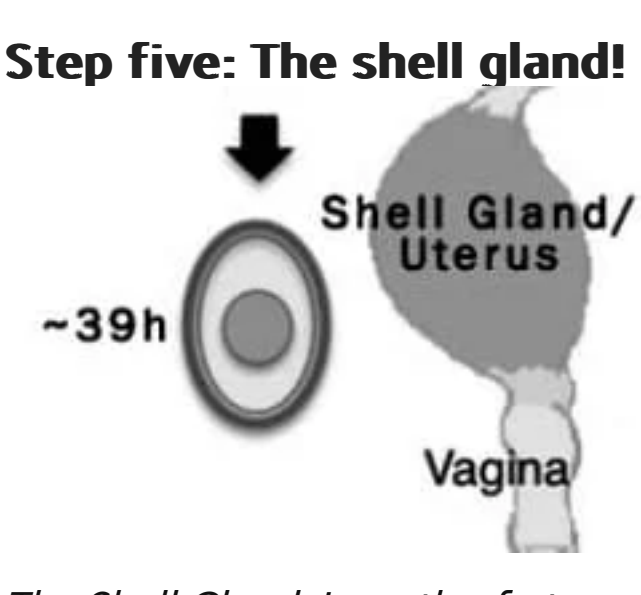
A study of female barn owls found that almost all of their pre-laying weight gain was due to water accumulation. The owls accumulated fat primarily in their brood patches, causing them to increase in size. We're not just imagining a female eagle's larger brood patch and slightly bigger appearance. She has gained water weight and shifted fat to her brood patch in preparation for egg-laying and incubation.

Step four: The isthmus! Length of stay: ~3 hours (T – 39.5 hours)

Next, the ovum moves into the isthmus, where it is coated with a third layer of albumen and develops two membranes to protect it from bacterial contamination and keep water from escaping too quickly. The inner and outer shell membranes will eventually be separated by a third membrane that develops in the first three of four days of an embryonic eagle's life.

The chorioallantoic membrane, aka CAM, is a highly vascularized structure similar in some ways to a placental cord. It sits between the inner and outer shell membranes and exchanges gas and transports calcium from the eggshell to the developing embryo. The CAM will not develop unless the egg is fertilized. An unfertilized egg's inner and outer shell membranes are less effective at stopping bacterial contamination and preventing water loss.

Step five: The shell gland!

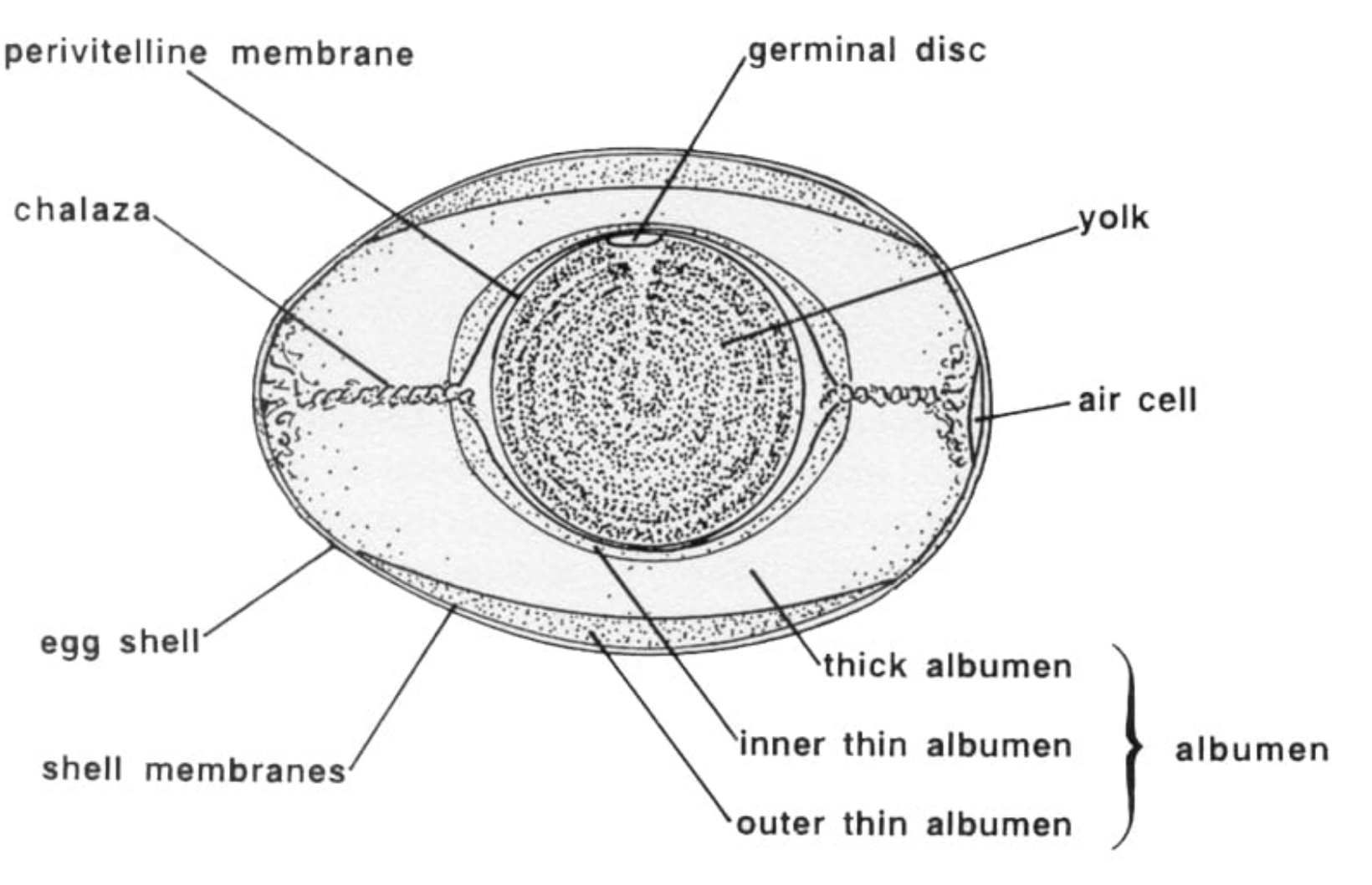


The Shell Gland. Length of stay: ~39 hours (T – 15 minutes)

The ova is beginning to resemble an egg! Wrapped snugly in its jacket of albumen and shell membranes, it moves into the shell gland or uterus, where it will remain for roughly 39 hours. Water and minerals are pumped into the developing egg and a hard calcareous shell is formed around it.

Our female eagles are removing a lot of calcium from their bodies to produce the egg shell. While I couldn't find figures for bald eagles, hen chickens remove about 25 mg of calcium from their blood every 12 minutes during active egg shell formation. Since bald eagle eggs are significantly larger than chicken eggs, it seems very likely that they are removing more calcium than that. Anything that can't be derived from dietary sources will be obtained from special bones in a female bird's skeleton: another reason that food is extremely important right now!

Step six: The vagina and egg labor!



From follicle to fully developed egg! Length of stay: roughly 15 minutes

We finally have an egg! Cell division is well underway and the once-microscopic yolk has been wrapped in membranes, plumped up, and surrounded by a hard shell. While we don't know whether our eagles were aware of the egg before, they are certainly are now! Let's use Mom as an example. Contraction of a powerful sphincter muscle causes her egg to rotate in her muscular vagina and enter her cloaca pointed-end first. Her powerful vaginal muscles and full-body contractions eject the egg through her cloaca and into the waiting egg cup. Two days after Mom's first egg was started, it emerges after her brief egg labor and she lays down for a well-deserved rest! Her second egg is just beginning its journey.

Do female eagles feel pain during egg labor?

Do female eagles feel pain or discomfort in the final phase of laying? Here's what we've seen at our nests. Two or three days before any given female eagle lays her first egg, we start seeing her on and around the nest more. Males often ramp up food gifts and females may spend a long period of time on the nest immediately before laying their first egg. Female eagles chirp softly and appear to feel some discomfort during egg-laying, although we don't know how painful or uncomfortable it is.

Egg laying is energetically expensive and female eagles usually fall into a deep slumber after laying their first egg, which often comes at or after dark. We're wishing sweet eagle dreams to all of our eagle Moms this year!

What happens when a bird loses its nest and mate with an egg in the pipeline?

In 2017, an interloper laid an egg in the peregrine falcon nest box at Dairyland Alma before the returning territorial female ousted her. While there isn't much information about it, I suspect that any eggs in the pipeline get laid somewhere. But follicle stimulation is about more than just lengthening daylight hours! To get into *condition*, a female bird of prey needs a mate, a nest, plenty of food, and a lot of bonding. If those things are taken away, her body will shut follicle stimulation and yolk production down. This prevents additional eggs from forming: a wise strategy given how energy intensive egg production is!

Who came up with these awful names?

People have studied birds, especially domestic chickens, for a long time. The names we use now were borrowed from Latin or Greek and given to various parts of a bird's reproductive tract based largely on form versus function: *that looks like a funnel, so let's call it a funnel!*

- **Infundibulum** is derived from a16th century Latin word for "pour in" (or funnel): *infundere*.
- **Chalaza** is derived from a Greek word that means "small knot": *Khalaza*.
- **Magnus** is a Latin word that means "great". The *magnus* is the largest part of the oviduct.
- **Isthmus** is derived from a Greek word that means narrow neck of land: *isthmos*.

Things that helped me learn and write about this topic!

- The 'Guide to Bald Eagles' produced by our mod team
- Avian reproductive system, female: http://articles.extension.org/pages/65372/avian-reproductive-systemfemale
- The avian egg: http://www.poultryhub.org/physiology/the-avian-egg/
- and http://people.eku.edu/ritchisong/avianreproduction.html
- Formation of the egg: http://www.thepoultrysite.com/publications/1/egg-quality-handbook/2/formation-of-the-egg/
- The avian ovary and follicle development: some comparative and practical insights: http://dergipark.gov.tr/download/article-file/134144
- Sperm-Egg Interaction during Fertilization in Birds: https://www.jstage.jst.go.jp/article/jpsa/53/3/53_0150183/_pdf
- Books: The Most Perfect Thing: Inside (and Outside) a Bird's Egg (Tim Birkhead), The Hen's Egg and its Formation in Atlas of Chick Development (Ruth Bellairs, Mark Osmond), and Ornithology (Frank B. Gill)

Image Credits

- Diagram from the paper Sperm storage in the female reproductive tract in birds, Sasanami T, Matsuzaki M, Mizushima S, Hiyama G – J. Reprod. Dev. (2013). Taken from Open i, US Department of Health and Human Services, https://openi.nlm.nih.gov/detailedresult.php?img=PMC3944358_jrd-59-334-g001&req=4.
- Egg cross section derived from The Avian Egg: Alexis L. Romanoff, A.J. Romanoff, 1949. Image credit poultryhub, although it appears in other places as well: http://www.poultryhub.org/physiology/the-avian-egg/. If you own this image and do not want it posted or need the credits changed, please contact me: amy@raptorresource.org.

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