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Turkey Vultures: a Photographic Guide for Aging Nestlings



Turkey Vulture, estimated 33 days old, near St. Paul, Alberta, 8 July 2005

Alberta Species at Risk Report No. 124

Turkey Vultures:
a Photographic Guide for Aging Nestlings

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This guide is roughly modeled after the photographic guides for aging of the Turkey Vulture (*Cathartes aura*) (in Ritter 1983), Red-tailed Hawk (*Buteo jamaicensis*) (Moritsch 1983a), Prairie Falcon (*Falco mexicanus*) (Moritsch 1983b), Ferruginous Hawk (*B. regalis*) (Moritsch 1985), American Kestrel (*F. sparverius*) (Griggs and Steenhof 1993), Northern Goshawk (*Accipiter gentilis*) (Boal 1996), Peregrine Falcon (*F. peregrinus*) (Clum, Harrity, and Heck 1996), and Swainson's Hawk (*B. swainsoni*) (Gossett and Makela 2005). We thank those authors, and the publishers of those accounts, for their contributions that also helped the development of this photographic aging guide.

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EXECUTIVE SUMMARY

In east-central Alberta, in 2003-2008 a number of Turkey Vultures (*Cathartes aura*) nested somewhat regularly in abandoned farm buildings that could be relatively quickly and safely visited. Three nestling Turkey Vultures were encountered within hours of their hatching - in 2004 a first nestling in a brood of two, and in 2008 the second nestlings in two broods with two nestlings. These encounters allowed flash photographs to be taken of these three exactly-known-aged nestlings at intervals until near or at the age of making their first flights. Their siblings were assumed to have hatched two days later (2004) or two days earlier (2008), and the ages (and photographs) of those three nestmates were assumed to be known within one day. Nestlings from two 2006 nests also contributed a smaller number of known-age photos.

Some major landmarks for aging vulture nestlings include:

- Newly hatched nestlings, for some hours, still have some of their down feathers remaining wet.
- The growing, down-covered nestling has few 'landmark events' until feathers appear.
- At 14 days of age, the quills of the primary feathers of the wings become the first of the flight and contour feathers to poke through the white downy covering of the nestling.
- At about 17 days of age the nestling can stand on its feet.
- For weeks the wing and back feathers develop, to finally cloak the upper side of the nestling; the neck and breast feathers appear much more slowly.
- At 53 days of age, finally the first feathers show on the legs.
- In the last 10-15 days preceding flight, the feather coat becomes complete and the earlier down coat is almost totally lost.
- When it makes its first flights, at between 60 and 70 days of age, the young vulture usually still retains small patches of down on its neck and legs, and tiny wisps of down attached to feathers everywhere.

The photographs of these known-age nestlings, from 37 of the 68 days from hatching (age 0) to 67 days of age, and the accompanying descriptive notes, are intended to allow users of this catalogue to estimate the age of nestling Turkey Vultures, from their own photographs, to within +/- two days, without handling the young birds.

1.0 INTRODUCTION

Accurately known ages of young birds in the nest can be very useful information for wildlife researchers and managers. Back-dating and forward-dating from known-age nestlings can provide the approximate dates of their egg-laying, hatching, fledging, and their independence from parents or the nesting site, and can be used in studies of the influence of a variety of factors upon the nesting cycle, including global warming. The known age of nestlings may be important for planning the dates at which they are to be banded or wing-tagged, or otherwise sampled. The dates of fledging and independence from the nest site sometimes are important for ensuring adequate protection from disturbance until the vulnerable young birds have safely departed.

In this report we provide an extensive series of known-age photographs and descriptions of nestling Turkey Vultures.

2.0 STUDY AREA

In 2003 we began a long-term study of Turkey Vultures in east-central Alberta, at the northern edge of their breeding range. Through 2008, almost all of the known vulture nests in our study were in abandoned farm buildings. This population appeared to be reproducing well and slowly expanding (Nelson et al. 2008). From 2003 to 2008, in each year we visited between nine and 18 broods, for a total of 81 broods that we knew, or strongly suspected, fledged young. Sometimes we visited specific broods a number of times. At almost every visit we took photographs of the nest contents. Initially we compared our photos with the 10 published known-age photos in Ritter (1983) to roughly age our Alberta nestling vultures.

3.0 METHODS AND DISCUSSION

3.1 Known-age Photos of Turkey Vultures, and Alberta Data Collection.

Ritter's (1983) paper was about a Turkey Vulture nest in a cliff cave in California. It included a photo from 1977 of two "newly hatched young" with a pipped third egg that hatched the following day; i.e., the three nestlings may have hatched over a period of two days. Ritter's other known-aged photos were from the 1979 brood at the same nest, composed of three nestlings that were visited, photographed, and weighed at regular intervals until flying. For this brood, at the first visit all three nestlings were already hatched and "were estimated to be four days old, plus or minus two days". As they grew, Ritter noted that the developmental chronology of the three nestlings "appeared to vary by two to three days". Because of (a) uncertainties about the absolute ages of the nestlings in Ritter's known-age photos, (b) possible differences between the growth rates of nestling vultures in southern California and central Alberta, and (c) opportunities presented by our vulture population that was nesting in buildings, we sought an Alberta collection of known-age photos of vulture nestlings.

In Alberta, near fledging, 80% of the vulture broods had two nestlings, and the remainder had one; we saw no clutches or broods of three. In the broods that we saw at hatching, it appeared that the two eggs hatched about two days apart; i.e., the Alberta clutches had asynchronous hatching. In each brood of two nestlings, especially when old enough to show some flight or contour feathers, there was a conspicuous difference in the development between the two nestmates that usually corresponded to two days of growth. Pending confirmation from studies of marked nestlings, we therefore assumed that, if the broodmates were fed normally, this apparent age separation of approximately two days between nestmates would be evident from hatching until the nestlings were fully feathered.

In 2004, DM chanced upon the “NSR” nest on the day that the first nestling hatched; in places its down was still wet. The second egg was assumed to have hatched two days later, and DM photographed that brood at intervals until both youngsters were flying. In 2006, RWN visited two nests, documented the hatching process, visited each several times until the single nestling in each was about two weeks old, then visited each near fledging time; at one of the sites the nestling’s carcass showed that it died at about four weeks of age, perhaps of starvation; the other nest’s youngster provided photos. In 2008, RWN visited two nests on the hatching day of the second nestling at each nest; he then visited and photographed the nestlings at those nests five and seven times, respectively, at specific ages, in order to fill in gaps in our previous series of known-age photos.

Our photos were taken with two point-and-shoot 5 MP digital cameras with 8X and 10X optical zoom, and one 10MP digital SLR camera with zoom lenses. Most of the photos were taken from 1-3 metres from the young vultures. Almost all of the indoor pictures were taken using the camera’s flash. Flash photographs provide very much more information than a simple inspection of the bird with a flashlight. Some photos have been greatly cropped in order to remove extraneous background material.

This report provides known-age photos of nestling Turkey Vultures in east-central Alberta from hatching (0 days old) through to 67 days old. Photos are included for 37 of those 68 days. The largest gap is four days (17-20 days old, and 29-32 days old), and there are two gaps of three days (37-39 days old, and 47-49 days old). Most of the photos are from the three nests visited in 2004 and 2008, with a small number of photos from the two nests visited in 2006. At each of the 2004 and 2008 nests, the date of hatching of only one of the nestlings was certain, and the date of hatching of the other nestling was assumed (based on observations from other nests) to be approximately two days later (2004) or two days earlier (2008); at these three nests, at subsequent visits the differences in featheration between the two nestlings also suggested that the hatching interval had been about two days. Therefore, we feel confident that all of the ages applied to these nestlings and their photos are accurate to within one day.

Male and female Turkey Vultures do not display sexual size dimorphism, i.e., they are essentially the same size (Wheeler 2003). In almost all diurnal raptors, for example, females are substantially larger than males, take longer to reach full size, grow in their

feathers at slightly later ages, and leave the nest several days later than their brothers. This complication does not occur in Turkey Vultures.

The descriptive notes associated with these photographs pertain almost totally to these (and other) photographs. We did not handle the young vultures to determine, for example, at what age the tail feather tips burst from their sheaths or when pin feathers first appear through the skin on the neck. Unlike with other species (e.g., see Boal 1996), because so very little is known about the behavior of adult and offspring Turkey Vultures at the nest, we have been able to use only the tiniest amount of information from the behavior of adults and young vultures to help observers tell the age of the nestlings.

3.2 Ages of First Flight

Although we did not study it closely, it was clear that the ages at which the young vultures made their first flights varied considerably. Some nestlings first flew from spacious upstairs windows at about 61-63 days of age. Others, that were reared on ground floors, or were reared upstairs but with high, small exit windows or other entrances, were very well feathered, with very little down showing, but apparently had still not made their first flights outside at 65 days old and older, unknown ages when we visited. Considering all nests, the nestlings probably first flew at an average age of 65 days.

On two occasions, during the day we found already-flying young vultures back inside their home buildings, and in one case we caught and tagged it and in the other case we could have caught it but it was already tagged.

3.3 Intrusions

In obtaining this series of photos we attempted to be minimally intrusive. Our flash photos were taken from at least one metre away from the nestlings, nestlings were not removed from the buildings for photographing, and measuring tapes or grids were not placed next to or beneath nestlings as size references. Most of the nestlings were not touched until they were old enough to be wing-tagged. Our photos and written descriptions are *not* based on subtle changes that might be detected only from nestlings in the hand.

With Turkey Vultures, Coleman and Fraser (1989) tested weight, wing chord, and length of the fourth primary, as predictors of nestling age. Wing chord was found to be the best predictor of age and was accurate within 1.79 days. They found that in times of food stress in nestlings, feather growth took precedence over weight gain, and a temporarily starving nestling continued to grow feathers at apparently normal rates. These points provide support for our use of feather growth of nestlings, as seen in photos, as indicators of the nestlings' ages. Until 2008 we did not have permits to handle young vultures, to turn them for photographic purposes, or to photograph opened wings. Indeed, throughout this project we sought a method of aging the nestlings that did *not* involve handling them.

3.4 Purpose

It is our intent and belief that most diligent users of this document will be able to age most nestling Turkey Vultures to within +/- two days by:

1. Taking telephoto close-up flash photographs of nestlings, especially including both side-views and front-views of the body and head, and including underwings, back, and legs when possible
2. Comparing those photos very carefully, detail by detail, with the pictures that are catalogued in this document.

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APPENDIX A.

A.1 Summary of Highlights in Turkey Vulture Growth

Age	Feature	Period summary
0	Down may be wet, confirming recent hatch. Eyes conspicuously bulge from sides of head. Eyes can open. Mostly sleeping, hunched up.	0-14. Aging is difficult because the young bird may seem “large”, and there are no real benchmark events. Much of the first 3-4 days is spent sleeping. The head and beak grow rapidly, causing the bulging eyes to soon seem smaller. The rounded ‘beak’ becomes more pointed and a ‘real’ beak. Finally some real feather quills, the primaries, show on the hand.
2	Looks about, alertly, but briefly. Skin of crop may be conspicuous if food is in it. Wide circle of short down around ear opening.	
4	May threaten with hiss and wings out. The bulging eyes are almost even with sides of head.	
7	Oldest age seen with a parent brooding it in daytime.	
9	Patch on belly still is naked and pink.	
13	Tip of beak, distal to nostrils, now is separated from the face by a line.	
14	First quills, of the primary feathers, show through the down on the hand.	
15	Egg tooth is still present.	
16	Egg tooth is gone.	
17	Nestling can stand on its feet.	
21	Quills of the alula show. A hint of the line of secondary feathers shows. Beak is shiny black, different from gray head.	
26	Wing covert feathers begin poking through. Still only a hint of feathers on the back.	
33	Much “gray” from wing coverts poking through the down above the wide and solid line of the primaries and secondaries on lower edge of the wing. Tail feathers protrude 2-3 cm beyond down.	
34	Peak of down on ‘crown’ is thinning. A few back feathers may show through the down.	
35	Many back feathers just showing. Wing coverts poking through most of downy upper surface of wing.	15-53. Dark feathers poke through the down, and slowly the young bird’s coat turns from white to very dark brown. The flight feathers of the wing are first to appear, and continue growing until well after the young bird flies. Instead of shuffling about, at about 17 days the young bird stands and walks. The wing coverts and back feathers fill in, so that from the back the bird is mostly dark; but the front remains almost solidly white down. Between 36 and 43 days old, the first breast feathers poke through, and slowly start infiltrating. At and just after 50 days, the massive white downy ruff around the bird’s neck starts to thin out, and some neck feathers poke through. At 53 days, the first feathers poke through below the big downy puffs on the legs. Bird is mostly dark on the back, still mostly downy white on front, with breast feathers growing in rapidly.
36-43	First breast feathers poke through down, next to wings.	
44	From behind, is mostly dark because of back and wing feathers. From front, mostly white down because only a few side-breast feathers show.	
46	Still a massive white ruff of down around the neck.	
50	The neck ruff begins thinning markedly. ‘Crown’ of feathers just pokes through just in front of the ruff. A narrow downy band remains behind ears and eyes and over top of head until after flying.	
53	All birds have lost the huge ruff of down from the back of the neck; many feathers poke through. Breast is still mostly white, with patches of dark feathers, but no continuous dark band of feathers side-to-side yet. First leg feathers show, below the down.	
54	A few feathers show at front of the neck.	
56	Dark feathers finally complete a band across breast.	
54-60	Appearance is very ‘shaggy’ or ‘shabby’, with diminishing amounts of down remaining on breast, neck, and legs.	
62-67	Back and underwings almost free of down except for many wisps (threads). Small patches remain on neck, breast, sides of low back, and legs. Narrow downy ruff remains behind ear and eye and over top of head. First flights usually occur.	
64	In side-view of perched bird, wing feathers reach to within a few centimetres of tip of tail.	
		54-flying. By about 56 days, there are solid dark bands of feathers across the breast. When they first are able to fly, at about 61-67 days depending on the nature of their home, most young vultures retain small patches of down on the neck, breast, and legs, and many thin wisps of down trailing from dark feathers everywhere.

A.2 Ages 0 to 14 Days - Hatching to First Appearance of Wing Feathers

When they are young, aging nestling vultures was difficult, partly because of their rather large size, and partly because after they were a few days old the young vultures quickly became very alert and relatively mobile. For people who were familiar with young raptors, aging young vultures was very puzzling. Turkey Vulture eggs are large (ca. goose-sized), and when the down of newly hatched nestlings was dried off and fluffed out, these young birds were surprisingly large. Nevertheless the newly hatched vultures were relatively helpless and seldom in motion. It was fortunate when large pieces of eggshell remained nearby for a number of days, or an adult remained on or near the nestlings, as that helped to put the size of the nestlings in perspective and gave hints of their age.

On the other hand, after their first few days of relative inactivity, the growing nestling vultures gave the impression of being much older than they really were, in part because they could be very alert and relatively active. At one nest we found a four day old nestling all alone, but it was already threatening us! When visited when it was seven days old, we found a parent again brooding it.

In the first few days, the prominent eyes that bulged beyond the sides of the head slowly became less obvious because of the growth of the nestling's skull. The beak, initially relatively short and rounded, became longer and more pointed. The egg tooth, used in hatching, initially was somewhat inconspicuous near the tip of the beak, and it eventually eroded off or fell off by 16 days old.

When our point of entry into the vultures' nesting room was by way of the vultures' entrance window, or if our entry was between the nest and the vultures' entrance, when an incubating or brooding parent was present it did not try to flee past us but remained either on the nest, or close by the nest standing or crouched, or it moved into a corner and crouched there with its head turned away from us. In the few days immediately before and after hatching, sometimes a parent vulture remained on the pipped or chipping eggs, or the 0 to 3 day old nestlings, and had to be lifted gently by hand in order to see what was beneath. Earlier in incubation, and after the youngest nestlings were about 3 days old, at these nests the adult vultures moved off into a corner, or if there was much space between us and their exit they left the room by way of a nearby window, leaving the eggs or slightly older nestlings exposed for the short time that we were in the room or the attic. The nestlings appeared capable of independent thermoregulation at least as early as 7-8 days old, and we did not find a parent in the nest building, brooding or 'hiding' in a corner, during our daytime visits when the nestlings were older than 7 days.

Four and 6 days old nestlings hissed and weakly spread their wings as threats aimed at us. At 11 and 13 days old, nestlings began hissing when we were still downstairs. Almost all of the vulture nestlings held their wings slightly open, apparently as a threat, and hissed loudly at us, also apparently as a threat action. As they grew, the hissing became a loud roaring hiss, somewhat like the sound of air rushing out of a fire hose in advance of the

water. The hiss appeared to arise during inhalation by the young vultures. This noise was given almost continuously, often alternating from one bird to the other, until we departed.

At 11 and 13 days of age, when we got close to them, two nestmates both threat-lunged at us, apparently from a shuffling position (they appeared to be still too young to stand up on their legs). Individual older nestlings sometimes threat-lunged at us from a standing position, especially as we turned away or moved away. With a sudden, louder than normal (normally it is loud!) roaring hiss, and with a vigorous flap of the wings, the young vulture lunged up to ½ metre towards a person. Usually it then stood its ground. Although they often came very close, and could easily have bitten a pant-leg, only once were we struck – by a wing. Even when we were prepared for it, threat-lunges were always startling!

At 14 days old the nestling shows the first readily visible hints of quills of flight feathers, some of the primaries, in the outer part of the hand. This is a major landmark in the bird's development, for use in aging the young bird.

Until the appearance of the first primary feather quills in the bird's hand, there were few if any really conspicuous landmark features in its early development that allowed the observer to accurately tell the bird's age. In the first two weeks the nestling's age is indicated largely by its "gestalt", its alertness, its mobility, its self-defense, its shape, and the subtle changes from a 'cuddly, cute, short-beaked, ball of fluff' to a "down-clad, leaner, meaner, young bird with an 'attitude'."

The future development and age of the bird is landmarked by (a) the appearance of feathers, (b) the proportion of down to dark feathers in certain areas, later by (c) the disappearance of down from certain areas, and finally by (d) its first flight.

Age 0 Days

Appears fully clothed in white down except for the umbilicus and immediate surrounding skin on the belly. (The pink, bare skin around the umbilicus possibly remains for a few days. It was evident once when an adult tipped the nestling onto its back as the adult fled; the nestling slowly struggled back onto its belly.) Some pink skin shows through the down. For some hours after hatching the nestling will have some bits of wet down still on its back and head from hatching. Eyes can open, but usually are closed. Viewed from above, the eyes bulge out of the head (this lasts for several days). Spends most of its time hunched over, with head down. Beak is shorter and less conspicuously hooked and pointed versus a few days later. Egg tooth is somewhat conspicuous near the tip of the beak. Usually silent at the human visit; may give a squeaky hiss, or a two syllable peep-peep call.



Wet down feathers on the head, back, and rump; this nestling probably is just a few hours old. The intact egg is pipped at its upper left.



Above left : Left nestling is 0 days old; right, 2 days old. (Vomit is re-eaten later.) Above right - Left nestling is 2 days old; right, 0 days old.

Age 0 days (continued)



Nestling on left still has some wet down; 0 days old. Nestling on right is 2 days old

Age 1 Day. Egg tooth present. Eyes usually closed.



Age 2 days. Egg tooth present. Looks about alertly, briefly. Skin of the crop may show very conspicuously if some food is in it. Wide circle of down around the ear opening. Even when compared to the adult nearby, very young vultures seem huge for their age.



On left, 2 days old. On right, 0 days old. Same birds above and below.



Age 3 Days. Egg tooth still present. Appears huge relative to the eggshell. Still spends most of time with head down, eyes closed.



Age 4 Days. Egg tooth still present. Aware of approaching human; assumes mild threat with wings opened and hissing. Relatively alert for a few minutes.



Age 7 days. Egg tooth still present. Abundant pink skin still shows through the down, because of camera's flash. A single nestling was brooded by its parent – the oldest nestling that we encountered with a parent brooding it (or 'hiding' quietly in a corner).



Above and below left are same bird.



Age 9 Days. Egg tooth still present. The down circle around the ear opening now is relatively insignificant; the head seems to have enlarged considerably relative to the ear opening. Camera flash shows pink through the sparse down on the lower belly. When visited at mid-day, they had no parent with them or visible outside their building.



Above and below are same bird.



Age 11 Days. Egg tooth still present. A 'peak' of down on the forehead begins to 'pinch off' and thin out. No obvious quills developing in wings as seen from above or below. Even when greatly enlarged, photos show the beak (distal to the nostrils) to be still 'continuous' with the face, with no line forming the separation of beak from face.



Above and below are same bird.



Age 13 Days. Egg tooth still present. 'Peak' of down on forehead seems reduced. The beak tip (distal from the nostrils) now can be seen to be clearly separated from the face by a line.



Age 14 days. Egg tooth still present. The first hint of quills and flight feathers (some of the primaries) is seen in the outer part of the hand.



Age 14 days (continued).



Above, and close-up at lower right, are same bird.



A.3 Age 15 to 53 Days - First Appearance of Wing Feathers to Leg Feathers

After the first appearance of some of the primary feather quills in the hand at Age 14 days, the young vulture's age can be told rather accurately by the appearance of more dark feathers and the disappearance of the white down. During this stage of the young vulture's development, the observer critically looks for (a) the first appearance of feathers in certain areas, and (b) the proportion of down to dark feathers in certain areas, and (c) the loss of down from a few prominent areas.

First the primary feathers become conspicuous on the bird's hand. After two weeks of shuffling about on its tarso-metatarsi, the nestling first stands on its feet when it is about 17 days old, and usually is seen standing thereafter. Soon, near the bird's wrist, a patch of alula feathers comes into view and slowly becomes conspicuous. Then the line of secondary feathers along the lower edge of the forearm quickly becomes prominent. The tail feathers are prominent at this time too, but the young vultures usually face the human visitor and do not allow the tail feathers to be used as a good key to the young birds' ages. Then the wing coverts start poking through. And feathers across the back become evident. A few feathers begin to show on the sides of the breast. And, at the end of this stage of development, a few leg feathers finally poke through the down.

Age 15 days. Egg tooth still present but very inconspicuous. An enlarging patch of quills is evident on the hand (not seen in this picture). No other dark feathers visible.



Age 16 days. Egg tooth not present. Wings are often held open in threat. Quills of primary feathers are very evident on the outside of the wing, and also on inside of wing.



Above and below are same bird.



Age 21 days. The primary quills and feather tips are prominent. Near the wrist the small cluster of quills and feather tips is the alula. Behind the alula, just a hint shows of what will become a very conspicuous line of flight feathers, the secondaries. It is standing! The beak appears as a shiny, black instrument; the face now is grayer.



Age 23 days. The primaries are still well over $\frac{1}{2}$ sheath versus exposed feather, seen on outside and inside of the wing. The alula tips are slightly more evident. Behind the alula, and running along the back edge of the forearm, the line of secondary feathers becomes more obvious.



Age 26 days. The line of secondaries is very prominent. The alula is now at the 'front' of the wrist. A few wing coverts are seen behind the alula. The primary feathers are about $\frac{1}{2}$ sheath and $\frac{1}{2}$ exposed feather. Just a hint of feathers show on the back.



Pictures above are of same bird.

Age 26 days (continued). Evident here, and earlier, the vulture beak has an opening from one side to the other just in front of the nostrils.



Age 28 days. From the front, the young vulture is just a huge white bird with a dark face, with just the alulas hinting at the major feather growth happening on the bird's wings.



Age 33 days. Back feathers become apparent. Tail feathers conspicuously poke out. Above the line of secondaries there is a 'gray' area with many wing covert feathers emerging. Primaries appear to merge with secondaries when wing is closed. No neck, breast, or leg feathers appearing yet.



Age 34 days. Wing covert feathers very evident on the wrists. The protruding patch of down on the crown is thinning. Still no neck, breast, or leg feathers showing.



This is the same bird in both pictures

Age 35 days. Thinning crown 'line' of down. Many back feathers showing through. Wing coverts evident through the down of almost all of the upper wing surface.



Age 36 days. Very first hint of breast feathers, like shadows in the down, near the wing, but most birds do not show this until about Age 43-44 days. The dark area in the middle of the breast is the skin of the slightly filled crop. Wing covert feathers become more prominent on the wrist and above the secondaries and primaries. Crown down thinning.



Pictures above and below are of same bird at this age.



Age 40 days. Back feathers have become prominent. Tail feathers conspicuous, with sheaths mostly or entirely hidden. Secondaries and coverts are prominent.



Age 42 days. The featured birds show no hint of breast feathers poking through yet (vs. the hint seen in another bird at Age 36 days). The bird is dark from behind, but still extremely white from in front. Still a large downy ruff or plume behind the head. The emphasis on the growth of wing feathers is evident.



Above left and next page – same bird.

Age 42 Days (continued).



Age 44 days. Conspicuous feathers poking through at the sides of the breast. Viewed from behind, the bird is mostly dark, with thick wisps of down over its wings and back, and a huge ruff of down around the neck. Viewed from in front, the bird is mostly white, but now with a few conspicuous feathers on the sides of the breast, framed by the well-feathered but still very motley wrists.



Pictures above, and close-up below, are of same bird.



Age 46 days. The neck ruff is still a major feature; no feathers are evident on the back/top of the bird's head, but there is a further hint of thinning at the front of the ruff. Major amounts of wispy down may, or may not, still cling to the back and wing coverts.



Same bird above and below.



Age 50 days. The huge neck ruff has thinned markedly (in this bird; but see Age 51). A 'crown' of feathers appears just behind the front of the large neck ruff. The small downy ruff, just behind the eyes and over the top of the head, remains until after fledging.



Age 51 days. The thinned down, and the 'crown' feathers, at the top/back of the head are evident even in birds such as this that apparently are less good at preening away the old down. Dark feathers are scattered across the breast, but not yet in a solid band.



Same bird above and below.



Age 53 days. On the legs, the first feathers appear, below the down. Some feathers are well erupted on the 'crown', and the neck ruff is rapidly thinning. A few large dark feathers at the sides of the breast, but still no solid, dark patch extending across the breast.



Same bird above and below.



A.4 Age 54 days to flying. First appearance of leg feathers, to flying.

In the nestling vulture's last stage of development, from day 54 to first flight, the young vulture fills in the remaining white areas of down with dark contour feathers. In attempting to age the young bird, the human observer looks for the proportion of white to dark feathers in certain areas, the disappearance of down from certain areas, and finally the young vulture's first flight.

Some nestlings appear to take self-grooming less seriously than others do, and although their dark feathers are pushing through on schedule, they still retain many wisps of down or solid patches of down that hide the underlying, growing dark feathers. A single nestling, with no sibling to stimulate preening or other activities, does *not* seem to be more reluctant to preen away its down feathers.

In progression, the back becomes relatively free of down, then the breast, and finally the underwings, the neck, and the legs lose their last patches of down. Some thin wisps probably remain for a week or more after first flying, on the back and attached to the flight feathers. The young vulture may make its first flights with many small patches of down still evident on its breast, neck, and legs. Or, if its home is on the ground floor of a building and its first flights must be upwards, or if its upstairs home has a difficult-to-access high exit, the young vulture may be almost entirely free of down by the time it makes its first flight, perhaps close to Age 70 days.

Age 54 days. The long neck ruff is gone, and shorter down is being filled in by short feathers on the back of the neck. A few feathers show on the front of the neck.



Age 56 days. Dark feathers barely form a continuous patch across the breast and are sprinkled up to the throat. Still bands of down along the lower edge of underwing coverts of the forearm and hand, and the outer edge of the hand. Six large puffs of down remain, one on each side of the neck, one on each side of the lower back, and one on each leg.



Age 57 days. The breast feathers have rapidly filled in. The side-of-neck and leg puffs of down are being infiltrated with feathers but are still very prominent. From the front and 'outside', the wrists are now enclosed in feathers.



Same bird left and below.



Age 58 days. The small ruff of gray down is conspicuous at the top/back of the head; later it will thin to some degree, but it is evident on all young vultures when first flying.



Same bird above and below.



Age 59 days. Many globs of down may remain on neck, breast, and legs.



Same bird above and below.



Age 59 days (continued). The individual below (and its sibling, see Age 61) feathered out very rapidly at this stage, *or* preened off their down very thoroughly. The feathers of the neck are almost filled in. The leg feathers are almost filled in. Small globs of down remain on neck and legs and all along the lower edge of the underwing coverts .



Same bird above and below.



Age 60 days. Some birds retain considerable amounts of down in the neck, centre of the breast, and the legs, with many feathers poking through. But some have very little down remaining at this age (see one bird at Age 59 days).



Same bird above and below left and right. Co-author Rick Morse, below.



The bird below had made its first flight from upstairs.



Age 61 days. Neck, breast, legs, and underwings have little down remaining, but a few puffs remain, and wisps of down are found everywhere. The gray ruff around the back of the face is conspicuous.



Same bird above and below, sibling of 'early down-free' AAT shown at Age 59. Alora Nelson assisting.



Age 62 days. Back and underwings are almost free of down. Small patches remain on neck, centre of the breast, sides of the lower back, and the legs.



Bird above, a single nestling, not yet flying.
Bird below, atop chimney, had been out of its nest for at least two days. (Same as lower bird Age 60.)



Age 62 days (continued).



Age 64 days. The feather coat appears to be complete, with a few globs of down remaining on the sides of the neck and on the legs. Although the tail is not regularly visible because the young vultures usually face toward the human visitor, and although it is not shown very clearly here, note that the wing's feathers now reach to within a few centimetres of the tip of the tail. Compare with Age 61 days and especially Age 59 days.



This bird, on the roof, had been out of its nest for at least two days. Same bird as Age 62 bird, above

Age 67 days. Some patches of down remain on the neck and legs.



Almost certainly this bird had already made some flights from its building, and by chance we found it inside at this later visit. Both siblings were reported flying nearby in subsequent weeks.



A.5 Unknown Age - Flying

Upper photo: note the patches of down remaining on the legs and under the tail, and the wisps of down on flight feathers and coverts. The neck feathers are pulled down and away from the back of the head (a cooling method), but the downy ruff at the top/back of the head appears to stay in place. This vulture launched and flew well. It, or its sibling, was photographed minutes later on a power pole, below.





Same power pole as in photo on previous page, but this picture shows the previous year's brood.

For a list of additional reports in the Alberta Fish and Wildlife Division – Species at Risk Series please go to our website:

<http://srd.alberta.ca/fishwildlife/speciesatrisk/projectreports.aspx>

Thank you!