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# THE LOSS OF AVIAN CAVITIES BY INJURY COMPARTMENTALIZATION[1]

JAMES A. SEDGWICK AND FRITZ L. KNOPF
*U.S. Fish and Wildlife Service, National Ecology Research Center, 4512 McMurry, Fort Collins, CO 80525-3400*

*Key words: Compartmentalization of injury; cavity-nesting birds; cavity dynamics; cottonwood bottomlands; Colorado.*

Cavity-nesting birds are dependent upon the availability of suitable substrates for nesting, foraging, and roosting. For nesting and roosting, substrates must be large enough in diameter to contain a cavity and soft enough for excavation to occur. Cavities are believed to be available to cavity-nesting birds and other species of wildlife until the cavity deteriorates, or until the tree or limb containing the cavity falls. Cavity deterioration may occur over a period of years, with the cavity entrance becoming too large, or the back, sides, or bottom of the cavity compartment decomposing to the point where the cavity becomes unsuitable. Cavities in fallen limbs or boles are typically no longer available to cavity-nesting birds; however, we have observed Black-capped Chickadees (*Parus atricapillus*) using cavities in fallen, leaning limbs and House Wrens (*Troglodytes aedon*) using those in fallen boles along the South Platte River in northeastern Colorado (Sedgwick and Knopf, unpubl. data). Other species (e.g., Turkey Vultures [*Cathartes aura*]) may also use cavities in fallen limbs and boles (J. Tate, pers. comm.).

Here, we provide evidence of another way in which cavities become unusable. Incidental to a larger study of habitat relationships of cavity-nesting birds along the South Platte River in northeastern Colorado (see Sedgwick and Knopf 1990 for a complete description of the study area), we monitored a pair of Black-capped Chickadees nesting in a live plains cottonwood (*Populus sargentii*) in the summer of 1985. The cavity was a "knothole" cavity (i.e., at the site of a previous limb break) and was in living substrate. Cavity height was 1.6 m and cavity entrance diameter was 3.0 cm, barely large enough for an adult to squeeze through. Adult chickadees were actively carrying food to the cavity and feeding young in June 1985. Upon revisiting the site two years later, we discovered that the cavity entrance had sealed shut (Fig. 1). New sapwood and bark had gradually grown over the cavity opening and sealed the cavity closed as the tree compartmentalized the wound. In 1990 we reexamined all cavities ($n = 181$: 157 in plains cottonwood, 10 in peachleaf willow [*Salix amygdaloides*], 14 in unknown species of [dead] trees) previously located in 1985–1986 and found an additional nine cavities that had become completely or partially resealed. A total of one House Wren, one Red-

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FIGURE 1. A resealed Black-capped Chickadee cavity in a plains cottonwood (arrow). The photograph was taken two years after the cavity was last known to have been used.

headed Woodpecker (*Melanerpes erythrocephalus*), four Black-capped Chickadee, two White-breasted Nuthatch (*Sitta carolinensis*), and two European Starling (*Sturnus vulgaris*) cavities had been resealed, or 10/181 (5.5%). Four of the 10 cavities were completely sealed and six had been reduced from 5–6 cm in entrance diameter to only 2–4 cm (Table 1).

Compartmentalization of injury in trees commonly occurs (Shigo 1983) and can result in the complete sealing of avian cavities (this study). Cavity loss by injury compartmentalization may be fairly common in cottonwood floodplains, given the high frequency of cavities in living substrates. Of all cavities examined in 1985–1986, 64/181 (35.4%) were in living substrate. Thus, 10/64 (15.6%) cavities that had the potential to reseal did so. Northern Flickers (*Colaptes auratus*), European Starlings, Black-capped Chickadees, and White-breasted Nuthatches often used cavities in living substrates (48.8%, $n = 43$; 55.2%, $n = 29$; 57.7%, $n = 26$; and, 100%, $n = 5$, respectively), and cavity turnover by compartmentalization should be higher for these species compared to those (e.g., Red-headed Woodpecker) that frequently nest in dead substrates. We found no resealed cavities of Northern Flickers, however, suggesting that as primary cavity nesters, flickers may keep cavities open and prevent entrances from resealing. The tendency of flickers to nest in previously used cavities (Lawrence 1967; Sedgwick and Knopf, unpubl. data) supports this notion; that is, in reusing an old cavity, flickers presumably spend some time refurbishing the cavity, including keeping the entrance open and preventing compartmentalization.

Our data confirm an inconspicuous aspect of cavity dynamics and indicate that certain cavities are available for shorter periods than previously thought. The unstated assumption that cavities remain available until the tree or limb falls, or the cavity decomposes, does not hold for all cavities in live plains cottonwood. Numerous other species of trees are also known to compartmentalize injury (Shigo 1983), suggesting that avian cavity closure may also occur in other forest types. Because secondary cavity-nesting birds are primarily

TABLE 1. Cavities resealed by injury compartmentalization along the South Platte River in northeastern Colorado.

| Species | Year found | Initial cavity entrance diameter (cm) | 1990 cavity entrance diameter (cm) | Tree species | Substrate | Cavity type | Substrate diameter at cavity height (cm) | Cavity height (m) |
|---|---|---|---|---|---|---|---|---|
| Red-headed Woodpecker | 1985 | 5.0 | 3.0 | cottonwood | live limb | knothole | 16 | 6.4 |
| Black-capped Chickadee | 1985 | 3.0 | 0.0 | cottonwood | live bole | knothole | 40 | 1.6 |
| Black-capped Chickadee | 1985 | 5.0 | 4.0 | cottonwood | live bole | knothole | 38 | 4.8 |
| White-breasted Nuthatch | 1985 | 4.0 | 0.0 | cottonwood | live bole | knothole | 55 | 3.9 |
| European Starling | 1985 | 5.0 | 2.0 | cottonwood | live bole | knothole | 35 | 11.2 |
| European Starling | 1985 | 6.0 | 3.0 | cottonwood | live bole | knothole | 30 | 10.0 |
| Black-capped Chickadee | 1986 | 3.0 | 0.0 | cottonwood | live bole | knothole | 44 | 7.2 |
| Black-capped Chickadee | 1986 | 5.0 | 4.0 | cottonwood | live bole | knothole | 42 | 3.3 |
| White-breasted Nuthatch | 1986 | [a] | 0.0 | cottonwood | live limb | knothole | [a] | 7.0 |
| House Wren | 1986 | [a] | 2.5 | cottonwood | live limb | knothole | [a] | 3.0 |

[a] No data.

limited by the number of available cavities (von Haartman 1956, Cody 1985), this unrecognized dimension of cavity dynamics should be considered as a component which may potentially influence the abundance and distribution of secondary cavity-nesting birds.

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