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American Beavers (*Castor canadensis*) Use a Hollow Baldcypress Snag as a Lodge

Susan B. Adams^{1,*} and Elaine M. Gelbard¹

Abstract - *Castor canadensis* (American Beaver) typically construct lodges out of tree trunks, branches, and mud, or dig dens into banks at the edges of water bodies. We observed Beavers in a Mississippi swamp using a hollow *Taxodium distichum* (Baldcypress) snag as a lodge. In 2016, they had constructed a mound inside of the snag and were observed sitting out of the water inside of the snag. In subsequent years, they continued to use the snag and, in autumn of 2020, constructed a more traditional lodge against it. After being disturbed, Beavers took refuge in another nearby hollow snag on 2 occasions. Beavers are adaptable, occasionally using unusual materials to construct lodges or dams or occupying non-traditional structures, but we found no previous account of them residing inside of a standing hollow tree.

Introduction. We describe *Castor canadensis* Kuhl (American Beaver, hereafter Beaver) use of 2 hollow *Taxodium distichum* (L.) Rich. (Baldcypress) snags (dead standing trees) as lodge and refuge in a shallow reservoir in Mississippi. We found no previous reports of such behavior, but Beaver have been poorly studied in southern forested (Baker and Hill 2003) and lacustrine (King et al. 1998) ecosystems relative to northern and western ecosystems.

Beavers typically reside in lodges, constructed in or adjacent to the water using mud and the boles and branches of trees, or in bank dens, which are often dug under a large tree or shrub (Baker and Hill 2003, Elsey et al. 2015, Jung and Staniforth 2010). Both lodges and dens typically include an underwater entrance, a nest area above water, and some ventilation for fresh air (Baker and Hill 2003). Beavers often use a bank den until a more permanent lodge is constructed, and lodges on shore frequently are built as extensions of bank dens (Baker and Hill 2003). Beavers may have multiple active and inactive lodges or dens distributed throughout their home ranges, with the secondary lodges (also referred to as summer lodges, temporary lodges, or shelters) used only during warm seasons, at least in the northern and western portions of the range (Baker and Hill 2003, Hay 1958, Kalinowski 2013, Tevis 1950). In the Adirondack Mountains, temporary lodges may be used during most of the summer (Kalinowski 2013). Temporary lodges or dens also likely provide refugia from predation while foraging and dispersing (Baker and Hill 2003, McNew and Woolf 2005) and may help Beavers avoid problems with fleas and parasites (Kalinowski 2013). Dispersing Beavers, typically juveniles, may use a temporary lodge or den during dispersal, as well as in their new home range until a primary lodge is established (McNew and Woolf 2005). Although Beavers nearly always reside in lodges or bank dens, they occasionally innovate, taking advantage of available materials for construction and using existing structures for refuges or in lieu of lodges or dens (Baker and Hill 2003, Elsey et al. 2015, Gore and Baker 1989, Jung and Staniforth 2010, McNew and Woolf 2005, Platt et al. 2009).

Study area. We made our observations in a ~350-ha reservoir, or “moist soil habitat”, constructed in 2000 in the Dean Hill Wildlife Management Area at Wildcat Brake, Yalobusha County, MS, just upstream of Enid Reservoir (Fig. 1). The shallow reservoir was

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managed to provide foraging habitat for migrating and wintering waterfowl. Water was impounded by 2 dikes forming a 90° angle, with an unregulated outflow in the corner. The water level was not actively controlled, so water-level data were not available.

The snag used as a lodge was 80 m from the nearest shoreline at the typical full-pool level and stood amidst a stand of Baldcypress trees, most living but some dead (Fig. 2). A vertical array of openings in the sides of the snag created potential entrances both above and below the water's surface at each water level when we visited. The snag, hollow at the bottom and open at the top, had a diameter at breast height of ~97 cm and was nearly 11 m tall. On 8 November 2020, when the water level was low, the snag was ~50 m from the water's edge and stood in water that was 44 cm deep.

Methods. We visited the site with 2–4 people in kayaks on 9 occasions, usually arriving at the snag from mid-morning to mid-afternoon. We visited in September or October from 2016 to 2020, with an additional visit in both November and December 2020 (Table 1). When possible, we observed the inside of the snag by holding a camera overhead and photographing with a flash through a hole in the snag or by looking through a lower hole in the side. Our ability to document conditions inside of the snag depended on gear available, water level, light conditions, Beaver activity (because we tried not to disturb them excessively), and lodge development. As the lodge became larger in 2020, it restricted our access to the snag and, thus, our ability to see inside. We sometimes deduced Beaver activity in the snag from sounds of their activity (Tevis 1950).

We searched 7 literature sources for evidence of Beavers occupying snags: BioOne, Dimensions, Google, Google Scholar, HathiTrust, Navigator, and Zoological Record. Search terms included: Beaver shelter, Beaver mound, Beaver platform, Beaver den, Beaver den

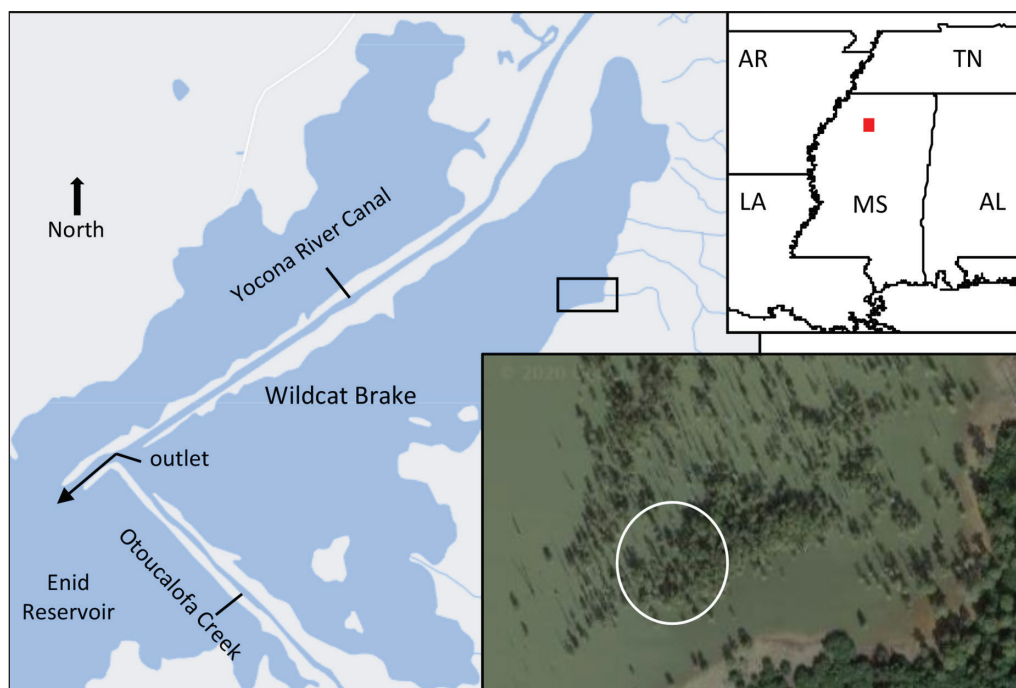


Figure 1. Map of Wildcat Brake, Yalobusha County, MS. The square indicates approximate location in state, and black rectangle indicates inset showing Google satellite image of approximate snag location (white circle).

hollow, bank dens, Beaver and hollow log, Beaver and snag, Beavers using snags as dens, Beaver and hollow log, Beavers using hollow trees as dens, bank dens in snags, Beaver in trees, summer Beaver dens, and unusual Beaver lodge.

Results. We observed Beavers inside of a hollow Baldcypress snag, or signs of recent Beaver activity at the snag, on 9 occasions from 2016 through 2020 (Table 1). The Beavers regularly modified the interior and exterior of the snag such that it looked different on most visits.

The Beavers constructed a mound, consisting primarily of mud and narrow strips of Baldcypress bark, inside of the snag. During many of our visits, numerous nearby Baldcypress trees had strips of bark recently removed from them (Fig. 2)—teeth marks suggested that the bark was stripped by Beavers. In 2016, several sticks leaned against, and into, a hole in the snag, and over the following years, more sticks appeared. During 2020, a progressively larger lodge was constructed against the snag (Table 1, Fig. 3). By 26 September 2020, the lodge construction was well underway, the Beavers having constructed a sort of “lean-to” with sticks angled against the snag, forming a roof and 2 sides, with the snag forming a third side and the fourth side remaining open. Under the lean-to, a mud mound allowed the Beavers to remain out of the water (Fig. 4). By 4 October 2020, the fourth side was closed off with sticks, and we could no longer see clearly into the developing lodge or the snag. On 8 November 2020, the top of the lodge was about 1.2 m above the substrate (0.7 m above the water’s surface), and the lodge wrapped around about 2/3 of the snag (Fig. 3). On 10 December 2020, we were again able to photograph the inside of the snag and document the underwater entrance and a mound protruding from the water (Fig. 4).

We saw Beavers at or in the snag (Fig. 4) or heard them moving inside of it during 7 of the visits (Table 1). Sometimes they were resting out of the water on the mound inside



Figure 2. Baldcypress snag used by Beavers viewed from the entrance side, opposite the lodge, on 10 December 2020 (left) and bark stripped from nearby Baldcypress trees (right), presumably by Beavers, in Wildcat Brake, MS.

of the snag. Largely based on sounds and bubble patterns, we witnessed them leaving and entering the snag underwater on multiple occasions. We first observed juveniles in 2020. On 26 September 2020, we encountered a juvenile about 100 m from the snag. It swam in a round-about path to the snag, joining with another juvenile along the way, and both entered the snag underwater.

Table 1. Observations of activity near snag, including lodge construction, and Beavers by visit date.

Date	Physical observations	Beavers observed
24 September 2016	Mound of mud and bark protruding above water inside of snag; several old and recent sticks angled against snag and into hole.	2 in snag.
19 September 2018	Mound of mud and bark protruding above water inside of snag; mud and sticks visible against the snag, including old and fresh sticks and fresh mud mounded against it on 2 sides.	2 adults in snag.
14 October 2019	Sticks leaning against snag. No observation made inside of snag.	Not recorded.
7 September 2020	Mound apparently not protruding above water inside of snag; no lodge visible outside of the snag, but sticks leaning against it and some sticks seen underwater.	2 adults swam to the snag, inserted their heads into a hole at water level, and remained there, immobile with most of their bodies visible outside of the snag.
26 September 2020	Old and fresh sticks and fresh mud. The Beavers had constructed a lean-to against the tree, under which a mound allowed them to remain out of the water. Unable to see if mound inside of snag protruded from water.	1 adult, 2 juveniles rested on mound under lean-to outside of snag. Juveniles then moved inside of snag, eventually departing underwater on far side from lean-to; 1 sheltered in secondary snag briefly. Adult remained in lean-to.
4 October 2020	Substantial lodge developing against snag, enclosed on all sides.	At least 1 Beaver in snag.
22 October 2020	Largest lodge yet observed.	None observed. Unable to see inside of snag.
8 November 2020	No evidence of additional sticks recently added to lodge, although fresh mud may have been added. No fresh strips of bark missing from nearby trees, but signs of more intense chewing on several neighboring trees.	1 adult, 2 juveniles resting and grooming on nearby log
10 December 2020	Lodge similar to previous visit. One recently chewed stick in water. Some strips removed from nearby trees and signs of gnawing.	1 Beaver inside and 3 outside of snag. When disturbed, 2 Beavers used secondary snag for >10 minutes.

In 2 instances, Beavers we had disturbed swam to another hollow snag ~25 m away, and entered it, remaining there for several minutes (Table 1, Fig. 5). The interior of the secondary snag was much less protected than that of the lodge snag and did not have a mound protruding above the water surface. The Beavers had chewed the lower rims of 2 holes in the sides of the snag, however, creating narrow ledges on which they could rest out of the water.

Discussion. Despite searching the literature diligently, we found no previous reports of Beavers using hollow standing trees—dead or alive—as lodges, shelters, feeding platforms,



Figure 3. Changes in the lodge outside of the snag from 2016 to 2020.

or refugia from predators. The snag, and the mound the Beavers constructed inside of it, appeared to have the main features of a lodge—underwater entrance, dry platform (except during very high water), and ventilation. Living space appeared to be expanded by the lodge constructed against the snag in 2020. What the snag, itself, may have lacked as a lodge was



Figure 4. Entrance hole and Beaver on mound inside of the snag on 10 December 2020 (left) and adult and juvenile Beavers in lodge being constructed against snag on 26 September 2020 (right) after another juvenile had retreated to the inside of the snag. Both juveniles subsequently left the snag from an underwater entrance, but the adult remained in place.



Figure 5. Nearby secondary snag temporarily occupied by Beavers after we disturbed them on 2 occasions. Pictured here is a Beaver that remained in the refuge after another one had departed, 10 December 2020.

overhead cover to protect the Beavers from inclement weather. It was difficult for us to see whether or not a “roof” was present inside of the snag; however, it appeared dark inside, so perhaps a feature of the snag created an internal roof.

Beavers may have used the snag as a secondary lodge from 2016 through summer 2020, before adding a more traditional lodge to the exterior of the snag in autumn 2020. However, the facts that we observed the Beavers, or signs of their recent activity, at the snag on every visit over 5 years and that we observed no other lodges in the vicinity suggested that the snag may have served as a primary lodge during all of the years. Also, the topography immediately around the reservoir was flat relative to the changes in water levels, making Beaver use of nearby bank dens unlikely. Conceivably, they could have had a den in the dike on the far side of the reservoir, but it would not have been close to the water when the water level in the reservoir was low. Prior to 2020, we only visited the snag in late summer/early autumn, so we do not know if the Beavers used the snag year-round then. In Colorado, Beavers began maintaining their primary lodge by mid-September (Hay 1958). Such a timeline would suggest that the Beavers in Wildcat Brake used the snag as a primary lodge, even in the early years of observations; however, behaviors and behavioral timelines likely differ in the southeastern US, where winters are much milder than in northern portions of the range (Baker and Hill 2003). The additional lodge construction outside of the snag and our observation of the Beavers using it in December suggested that they used it as a primary lodge at least beginning in 2020.

Some evidence exists for Beavers capitalizing on the structure provided by dead trees for their lodging or refuge, albeit not occupying snags. Bank dens are sometimes dug under stumps or logs (ODFW 2016). In southern Illinois, dispersing juvenile Beavers sometimes temporarily (<30 days) occupied hollow logs (fallen dead trees; McNew and Woolf 2005). They often left such refugia for several days, “presumably to seek more suitable settlement sites”, and if no better sites were found, they returned to these temporary sites (McNew and Woolf 2005:225).

Although establishing residence in a hollow snag may be unusual, Beavers have previously displayed their adaptability and ability to use materials at hand (Baker and Hill 2003). Beavers in areas with few trees have incorporated commercial lumber into their lodge (Elsey et al. 2015), built lodges without any large wood (Platt et al. 2009), and constructed dams using predominantly *Typha* spp. (cattails; Platt et al. 2009) or rocks (Jung and Stanforth 2010). In Florida, Beavers (presumably dispersing juveniles) used seasonally flooded caves as shelters and may have used 1 cave near permanent water as a primary den (Gore and Baker 1989).

Beavers are typically crepuscular and nocturnal (Baker and Hill 2003, Tevis 1950), but we observed them outside of the primary snag on 4 of 9 daytime visits. Had the Beavers not been so diurnally active, we could have easily overlooked their use of snags until 2020, when more traditional lodge construction became noticeable from a distance. Beaver lodges were abundant in and near flooded Baldcypress stands in Caddo Lake, TX, where Beavers stripped or gnawed bark from Baldcypress trees (King et al. 1998) as in our study, but Beaver use of hollow trees or snags was not noted in Texas. On at least some of our visits in Mississippi, Beavers left the primary snag after we evidently disturbed them. We do not know whether this response was because they did not feel adequately protected from predators inside of the snag or for some other reason.

Beavers face their greatest predation risk on land because most of their predators are primarily terrestrial, and Beavers are more agile in water than on land (Basey and Jenkins 1995, Gable et al. 2018, McNew and Woolf 2005). Although in the southeastern US,

Beavers have fewer terrestrial predators than in regions farther north, they may face some predation risk from *Alligator mississippiensis* (Daudin) (American Alligator) while in the water (Collen and Gibson 2001, McClintic et al. 2014, Wade and Ramsey 1986). Wildcat Brake appears to be just outside of the natural range of American Alligators (Powell et al. 2016), but the predators sometimes occur in the Yalobusha River drainage and have been seen there during the time span of our Beaver observation (L. Martin, Oxford, MS, pers. comm.). A network of hollow snags in the Beavers' home range may provide the rodents with valuable refugia from predation where American Alligators are present.

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