

## First Documentation of Two Types of Aboveground Den Structures in the Eastern Spotted Skunk (*Spilogale putorius*)

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**Abstract** - *Spilogale putorius* (Eastern Spotted Skunk) is a small, nocturnal carnivore that typically spends daylight hours resting in underground den sites. During a study on the den-site selection of *S. p. ambarvalis* (Florida Spotted Skunk) in the dry prairie of south-central Florida in 2016 and 2017, we tracked individuals to discernible aboveground structures composed of vegetation on 25 occasions. These structures were 1 of 2 easily distinguishable types: large mounds of vegetation primarily composed of shredded *Serenoa repens* (Saw Palmetto), or smaller cup-like structures with a horizontal entrance that resembled a ground-nesting bird's nest. These sites were occasionally reused by individual skunks, and on 1 occasion we observed 2 female spotted skunks occupying a site at the same time. Due to the absence of other wildlife species in the study area capable of making such structures, we believe that these structures were created by the skunks themselves. While Eastern Spotted Skunks are known to pull vegetation into their underground burrows, and have been documented occupying man-made structures (e.g., haystacks) as den sites, our observations represent the first documentation of aboveground, self-constructed structures being repeatedly used by this species. Use of these structures might be unique to *S. p. ambarvalis* (Florida Spotted Skunk) due to reduced predation risk or occasional flooding in the region that temporarily reduces availability of underground den sites.

### Introduction

*Spilogale putorius* (L.) (Eastern Spotted Skunk) is a small carnivore that historically inhabited a large portion of eastern North America (Kinlaw 1995), though the species is currently declining and is of conservation concern across much of its current range (Eastern Spotted Skunk Cooperative Study Group 2020, Gompper and Hackett 2005, Gompper and Jachowski 2016). The Eastern Spotted Skunk occurs in a variety of environments, such as the prairies and plains of Texas (Shaffer et al. 2018), the scrubby coastal strand of peninsular Florida (Kinlaw et al. 1995), and the high-elevation *Picea rubens* Sarg. (Red Spruce) forests of Virginia (Diggins et al. 2015).

The Eastern Spotted Skunk is primarily nocturnal, spending the majority of daylight hours inactive in dens (Benson et al. 2019, Kinlaw 1995, McCullough and Fritzell 1984). Here, we define a den as any structure, aboveground or subterranean, that meets 3 criteria detailed by Crabb (1948): provision of darkness, protection from weather, and protection from predators. Additionally, natal dens are used by female Eastern Spotted Skunks for parturition and subsequent care of young (Eng and Jachowski 2019, Sprayberry and Edelman 2016, Thorne and Waggy

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2017, Toland 1991). Studies of den-site selection have shown that Eastern Spotted Skunks use a wide variety of sites as dens, including ground burrows originated by other mammals, *Gopherus polyphemus* (Daudin) (Gopher Tortoise) burrows, rocky outcrops, tree cavities, root systems, hollow logs and stumps, woody debris, and *Neotoma floridana* (Ord) (Eastern Woodrat) nests (Eng and Jachowski 2019, Harris et al. 2020, Lesmeister et al. 2008, Sprayberry and Edelman 2018). Eastern Spotted Skunks are also known to use artificial structures at times (e.g., under buildings or in haystacks; Crabb 1948). Conversely, *S. p. ambarvalis* Bangs (Florida Spotted Skunk), the subspecies endemic to peninsular Florida, is known to rest above ground in shallow depressions or amongst vegetation without any discernible den site or structure (Harris et al. 2020). In this note, we document the use of 2 types of previously undescribed aboveground structures used by Florida Spotted Skunks as den sites.

### Methods

As part of a study on den-site selection, we fitted adult Florida Spotted Skunks with very high frequency (VHF) radio-collars (models M1525 and M1545; Advanced Telemetry Systems, Isanti, MN) and tracked them to den sites during daylight hours between February and July in both 2016 and 2017 (see Harris et al. 2020 for more details). For trapping, processing, tracking and all other field work involving Florida Spotted Skunks, we followed American Society of Mammalogists guidelines (Sikes et al. 2016) and complied with Clemson University Animal Care and Use Committee protocol (permit AUP2015-042). We conducted our research in an area of primarily dry prairie at Three Lakes Wildlife Management Area (hereafter, Three Lakes), Osceola County, FL. Dry prairie is a natural community endemic to south-central Florida that occurs on relatively flat land and is predominantly comprised of low grasses and shrubs (Florida Natural Areas Inventory 2010). Lower vegetation heights, relative to hardwood hammocks often adjacent to dry prairie, are maintained through frequent saturation of soils with groundwater and short fire-return intervals (generally 1–2 years; Florida Natural Areas Inventory 2010, Platt et al. 2006).

### Observations and Discussion

We identified 2 types of aboveground den sites during our study that were both constructed from vegetative matter but differed in size and the specific vegetation composition. The first type resembled a rounded dome in shape (hereafter, referred to as a “mound”). These mounds were primarily composed of small fragments of *Serenoa repens* (Bartram) Small (Saw Palmetto) leaves, with lesser amounts of other vegetative material, such as finely shredded Saw Palmetto trunk fibers (Fig. 1). Oftentimes, the mounds appeared to be built around a supporting structure, like the raised trunk of a Saw Palmetto. The approximate dimensions (L x W x H) of 2 mounds that we measured were 105 cm x 66 cm x 44 cm and 99 cm x 74 cm x 32 cm, respectively. Three of the 5 unique mounds we discovered occurred within



vegetation encircling depression marshes; these areas usually had thicker and denser vegetation than surrounding dry prairie as they often did not burn completely or at all during prescribed-fire treatments.



Figure 1. An aboveground mound (location within white circle) a *Spilogale putorius ambarvalis* (Florida Spotted Skunk) was tracked to using very-high frequency telemetry during daylight hours at Three Lakes Wildlife Management Area, Osceola County, FL, in 2016.



The second type of aboveground structure was smaller and made of finer vegetative material (hereafter referred to as a “nest”). These structures superficially resembled the nests of ground-nesting grassland birds like *Ammodramus savannarum* (Gmelin) (Grasshopper Sparrow) and *Sturnella magna* (L.) (Eastern Meadowlark) in their cup-like shape, horizontal opening, and inclusion of graminoids; however, the structures lacked the woven lining of fine vegetation common in these birds’ nests (Saunders 1932, Pranty and Tucker 2006). The skunks’ nests were primarily composed of vegetation such as grasses and shredded Saw Palmetto trunk fibers and matted together to make a small horizontal cup with 1 entrance (Fig. 2). The nests were often built at the base of a Saw Palmetto or bunchgrass species like *Aristida* spp. (wiregrass) or *Andropogon* spp. (bluestem). The approximate dimensions (L x W x H) of 2 nests that we measured were 12 cm x 15 cm x 19 cm and 16 cm x 13 cm x 10 cm, respectively.

We tracked 6 Florida Spotted Skunks (2 females, 4 males) to 5 unique mound structures on 8 total occasions. In one instance, we tracked and discovered 2 female skunks inhabiting a mound at the same time. This particular mound had at least 2 discernible entrances, and we noticed a midden outside of 1 of these den entrances with an abundance of scat that was consistent with that of an Eastern Spotted Skunk (Fig. 3). We tracked a male spotted skunk to this same mound 16 days later, at which



Figure 2. Two different aboveground “nests” *Spilogale putorius ambarvalis* (Florida Spotted Skunk) individuals were tracked to using very-high frequency telemetry during daylight hours at Three Lakes Wildlife Management Area, Osceola County, FL, in 2016. One nest is primarily composed of grasses (left), while the other nest (right) is predominantly composed of shredded *Serenoa repens* (Saw Palmetto) trunk. Entrances in each photograph are denoted with a white arrow. Pen below nest on left for scale.

time the females were not in the vicinity. We had previously tracked this male skunk to a different mound as well. Observations of multiple individual Eastern Spotted Skunks using the same den sites at different times, and especially communal denning of individuals, has been rarely documented for this species (Eng and Jachowski 2019, Harris et al. 2020, Lesmeister et al. 2008, Sprayberry and Edelman 2018).

We tracked 9 Florida Spotted Skunks (3 females, 6 males) to 15 unique nest structures on 17 total occasions. We tracked a male spotted skunk to a nest that he had reused on non-consecutive occasions 8 days apart. We also tracked this male to a different nest site over 2 consecutive days. While skunks would generally flee once we were within 5 m of a nest (likely owing to the nests' more exposed nature compared to a subterranean den and to the noise we made during our approach), we were once able to observe a skunk curled in a ball and resting in a nest that we had previously tracked the individual to. We did not observe any other spotted skunks reusing nests during our study. Three skunks (1 female, 2 males) used both a nest and mound during the time period in which we tracked them.

We were unable to confirm what species constructed the mounds and nests at our study site, but a number of factors lead us to believe that these structures were made by Florida Spotted Skunks. For one, we find it unlikely that any other animals



Figure 3. The entrance (A) of an aboveground mound a *Spilogale putorius ambarvalis* (Florida Spotted Skunk) was tracked to using very-high frequency telemetry at Three Lakes Wildlife Management Area, Osceola County, FL, in 2016. Florida Spotted Skunk scat (B) is visible outside the den entrance.



that occur in the region would make these structures. *Mephitis mephitis* (Schreber) (Striped Skunk) occurs in the region, but we never observed or captured Striped Skunks during extensive trapping efforts in the dry prairie ecosystem at Three Lakes over our 2-year study. Similarly, the range of the Eastern Woodrat extends into the region (Cassola 2016), but woodrat nests are usually constructed with sticks and twigs (Rainey 1956), which are readily available on the landscape due to the presence of abundant woody shrubs, not Saw Palmettos or graminoids like the mounds and nests we observed. Furthermore, Eastern Woodrats have not been trapped or otherwise confirmed at Three Lakes (S.L. Glass and C.L. Hannon, Florida Fish and Wildlife Conservation Commission, Kenansville, FL, pers. comm.) to date. *Neofiber alleni* True (Round-tailed Muskrat) occur in the region and have been recorded in the dry prairie ecosystem at Three Lakes (C.L. Hannon, Florida Fish and Wildlife Conservation Commission, Kenansville, FL, pers. comm.), but their houses are generally attached to emergent vegetation (not Saw Palmetto or other terrestrial plant species) and built over the water's surface (Birkenholz 1972). The nest structures, while resembling ground-nesting bird nests on first glance, had dimensions too large to have been constructed by birds at our study site. Eastern Spotted Skunks are known to pull grasses and other vegetation into underground dens to use them as a lining (Crabb 1948), and we observed this behavior on game cameras placed outside other spotted skunk dens during our study. We believe that the nest structures we observed were essentially created in this same manner with small pieces of vegetation that were gathered.

To our knowledge, structures like the mounds and nests we observed have not been documented for Eastern Spotted Skunks elsewhere. It is possible that these structures are unique to Florida Spotted Skunks in the area of our study or across the entire range of this particular subspecies. While mounds and nests only accounted for 2.5% of den sites assessed in our wider den-site selection study at Three Lakes (Harris et al. 2020), we hypothesize that there are at least 2 possible reasons for the use of aboveground resting and denning sites by Florida Spotted Skunks at the site. First, the high water table and low topographic relief in south-central Florida (Ali et al. 2000), and the presence of a subsurface layer of clay (Orzell and Bridges 2006) in dry prairie, lead to slow groundwater drainage and frequent flooding during heavy rain events that can inundate underground burrows spotted skunks would normally use for extended periods of time. Second, predation has been identified as the most common cause of mortality in Eastern Spotted Skunks in Arkansas (Lesmeister et al. 2010), but predation was possibly a contributing factor to only 1–2 of 5 mortalities of Florida Spotted Skunks fitted with VHF radio-collars during our 2-year study at Three Lakes (Harris et al., in press). Further, population density and survival estimates from Florida Spotted Skunks were relatively high when compared with estimates for other Eastern Spotted Skunk populations and other mephitids (Harris et al., in press). Thus, it is possible that predation risk is lower for Florida Spotted Skunks relative to Eastern Spotted Skunks elsewhere, allowing Florida Spotted Skunks to utilize relatively exposed aboveground structures. Future comparative studies are needed to assess how top-down predation pressure potentially influences behavior of Eastern Spotted Skunks.

Our observations of Florida Spotted Skunks using aboveground den structures further showcase the remarkable diversity of behaviors and life-history strategies employed by the Eastern Spotted Skunk across its range. The wide variety of natural and artificial den sites Eastern Spotted Skunks are known to use, coupled with the species' wide dietary breadth (Crabb 1941, McCullough and Fritzell 1984, Selko 1937) and the variety of environments it can occur in, suggest the Eastern Spotted Skunk is adaptable to a wide variety of environmental conditions—a conclusion that is seemingly at odds with the species' declining status across much of its range.

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