

Trumpeter Swan Killed by Gray Wolf in Minnesota

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Abstract - *Canis lupus* (Gray Wolf) have been suspected as natural predators of *Cygnus buccinator* (Trumpeter Swan), but detailed descriptions of such predation events are lacking from the peer-reviewed literature. Herein, we document a Trumpeter Swan that was killed by a Gray Wolf fitted with a GPS collar in northern Minnesota, thus confirming that wolves are natural predators of Trumpeter Swans.

Cygnus buccinator Richardson (Trumpeter Swan) populations have recovered dramatically throughout North America in the last 30 y (Mitchell et al. 2010). Trumpeter Swans are long-lived birds with high survival rates once adulthood is reached (>80%; Varner and Eichholz 2011). Typical sources of mortality in Trumpeter Swan populations include poaching, predation, disease, and lead poisoning (Blus et al. 1989). Trumpeter Swans have several natural predators, but predation is generally focused on eggs or vulnerable cygnets (Mitchell et al. 2010). *Canis lupus* L. (Gray Wolf) have been documented raiding nests of Trumpeter Swans to consume the eggs (Campbell 2004). Although it has been suspected that wolves are also predators of adult Swans, there are no documented instances in the peer-reviewed literature of a Trumpeter Swan killed by wolves (Mitchell et al. 2010). Herein we document a Trumpeter Swan that was killed by a Gray Wolf fitted with a global positioning system (GPS) collar in northern Minnesota.

Our observation occurred just south of Voyageurs National Park (VNP) in the north-central Kabetogama State Forest, MN (48°33'N, 92°90'W), which is part of the Greater Voyageurs Ecosystem (for more detailed description see Gable et al. 2018a). The Kabetogama State Forest is on the southern edge of the boreal forest and is part of the Laurentian Mixed Forest Province (Bailey 1980). There is an abundance of *Castor canadensis* Kuhl. (North American Beaver)-created wetlands that provide nesting habitat for Trumpeter Swans, *Branta canadensis* (L.) (Canada Goose), and other waterfowl (Windels 2017). Trumpeter Swan populations have been recovering in Minnesota since a reintroduction effort was initiated in 1987 (Kittelson 1996). Nesting swans are relatively uncommon in VNP at present, with <10 pairs nesting in the park most years (S.K. Windels, unpubl. data).

In May 2017, we captured V051, a yearling male Gray Wolf of the Sheep Ranch Pack, as part of a larger Gray Wolf predation project in and around VNP. We used a foot-hold trap to capture V051, and fitted the Wolf with a 20-min fix-interval GPS collar (Lotek IridiumTrack 1D, Lotek Wireless Inc, Newmarket, ON, Canada). We followed the methods outlined in Gable et al. (2016) to handle Wolf V051, and handling and processing was approved by the National Park Service Animal Care and Use Committee (protocol approval number: MWR_VOYA_Windels_Wolf_2015). We searched clusters of GPS locations from V051 to identify kills and understand predation behavior. We defined a cluster as a group of ≥2 consecutive locations (i.e., ≥20-min period) that were within a 200-m radius of the first location of the cluster (Gable et al. 2018b). Once at clusters, we searched the area in and around cluster locations for evidence of a kill.

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On 6 August 2017, we searched 2 clusters of locations in the same area from V051 that occurred from 9:00 to 11:00 and 15:00 to 21:00 on 4 August 2017. When searching cluster locations, we identified the remains (several large white flight feathers, other white feathers and down, part of the pelvic girdle, other pieces of large cracked bone) of a sub-adult or adult Trumpeter Swan that was killed by V051 in a beaver pond (Fig. 1). We were able to search these clusters of GPS-locations within 2 d from when they occurred, which allowed us to accurately assess whether this was a scavenging or predation event. We found some soft tissue still attached to the remaining bone fragments and there was no odor to suggest the swan had died and started to decompose prior to being consumed (carcasses that wolves scavenge in the warm, humid summers of northern Minnesota generally have a strong odor from decomposition). There was no evidence of blood at the kill, but that was to be expected because the kill occurred on a floating bog mat with water pooled over much of the mat (i.e., the water would have washed away all blood). When wolves kill small prey, there is often no blood at the kill site as the Wolves consume most of the carcass (Gable et al. 2016), and likely lick up all remaining blood and hair on vegetation (T. Gable, pers. observ.). We did not see any sign of other predators or scavengers at the kill, and we only found Trumpeter Swan remains near GPS locations from V051. Based on the size of the primary feathers and bones, and the fact that all the feathers were white, we can confidently conclude that this was a Trumpeter Swan. However, we do not have enough information to determine whether this bird was a sub-adult or adult.

The kill occurred at the end of a beaver pond that was dominated by a floating mat of grassy vegetation (about 1 m tall) with a few scattered shrubs (Fig. 1). Based on sign we



Figure 1. The floating bog mat at the end of a beaver pond where a GPS-collared Wolf killed a Swan in the Greater Voyageurs Ecosystem in northern Minnesota in 2017. There was a small channel tucked in the grass about 10 m from the remaining Swan feathers (not visible in this photograph), where the Wolf appeared to have initially attacked and ambushed the Swan before dragging the carcass to the location in the photograph where it started to consume the Swan.

observed at the kill site, we deduced that the wolf caught the swan as the bird moved through a small channel at the marshy end of the pond. We observed Swan feathers and Wolf hair in a circle of depressed vegetation about 3 m away from the location of the suspected initial attack. The wolf appeared to have then dragged the swan ~25 m off the floating mat into the forested pond edge, where the wolf consumed the rest of the swan. We found several bones, including part of the pelvic girdle and feathers, at this final consumption spot. Wolf V051 initially spent 2 h at the kill, left for 4 h, and then returned to the kill for another 6 h, spending 8.0–9.3 h (min–max; based on the 20-min fix interval) at the kill.

We suspect that V051 was able to capture the swan because the dense vegetation around the small waterway would have prevented the bird from being able to take flight. Further, the dense vegetation on the bog mat would have allowed the wolf to get close to the Swan undetected. Indeed, using ambush and stealth are the primary strategies of successful swan predators (Mitchell et al. 2010). However, it is possible the swan was injured or moribund allowing the wolf to easily approach and kill it. Nonetheless, our observation confirms that Gray Wolves will predate Trumpeter Swans.

Our account, in conjunction with the anecdotal observations from McEneaney (2006, 2007), suggests that Wolves can be natural predators of Swans in multiple systems across North America. We have intensively studied Wolf predation in the Greater Voyageurs Ecosystem during the period 2015–2018 by identifying both Wolf-killed prey and by collecting Wolf scats to quantify Wolf-pack diets (Gable et al. 2016, 2017, 2018c; Voyageurs National Park, unpubl. data). The evidence we present here is the first of wolves killing Trumpeter Swans in our study area, suggesting this is a relatively infrequent occurrence. However, McEneaney (2006, 2007) mentioned several instances of wolves catching and killing ≥ 5 adult swans in a 1-y period around waterways in Yellowstone National Park. As suggested by McEneaney (2007), wolf predation may be a limiting factor for Trumpeter Swans in some areas with dense Wolf populations (e.g., the Greater Yellowstone Ecosystem). More study is needed to better understand this dynamic.

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