

2020-2021 Greater Voyageurs Ecosystem Wolf Pack and Population Size Report

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WINTER 2020-2021 SUMMARY

Winter 2020-2021 was the most successful winter monitoring effort to date in the Greater Voyageurs Ecosystem (GVE) in terms of the number of packs studied and the number of independent observations of each pack (Fig. 1). In total, we estimated pack size for 14 packs and collected an average of 9.8 independent observations of the same pack size for each pack from December 1, 2020 to April 10, 2021. During this period, we had 320 observations of 2 or more wolves traveling together, though some of these observations were not independent (i.e., observations of the same pack on the same day). We considered observations to be independent if they were on a different day than any other observations of that pack. Multiple independent observations of the same pack size for each pack provides highly-reliable and accurate pack size estimates and ensures that pack size estimates are not based on 1 or 2 opportunistic, and potentially spurious, observations.

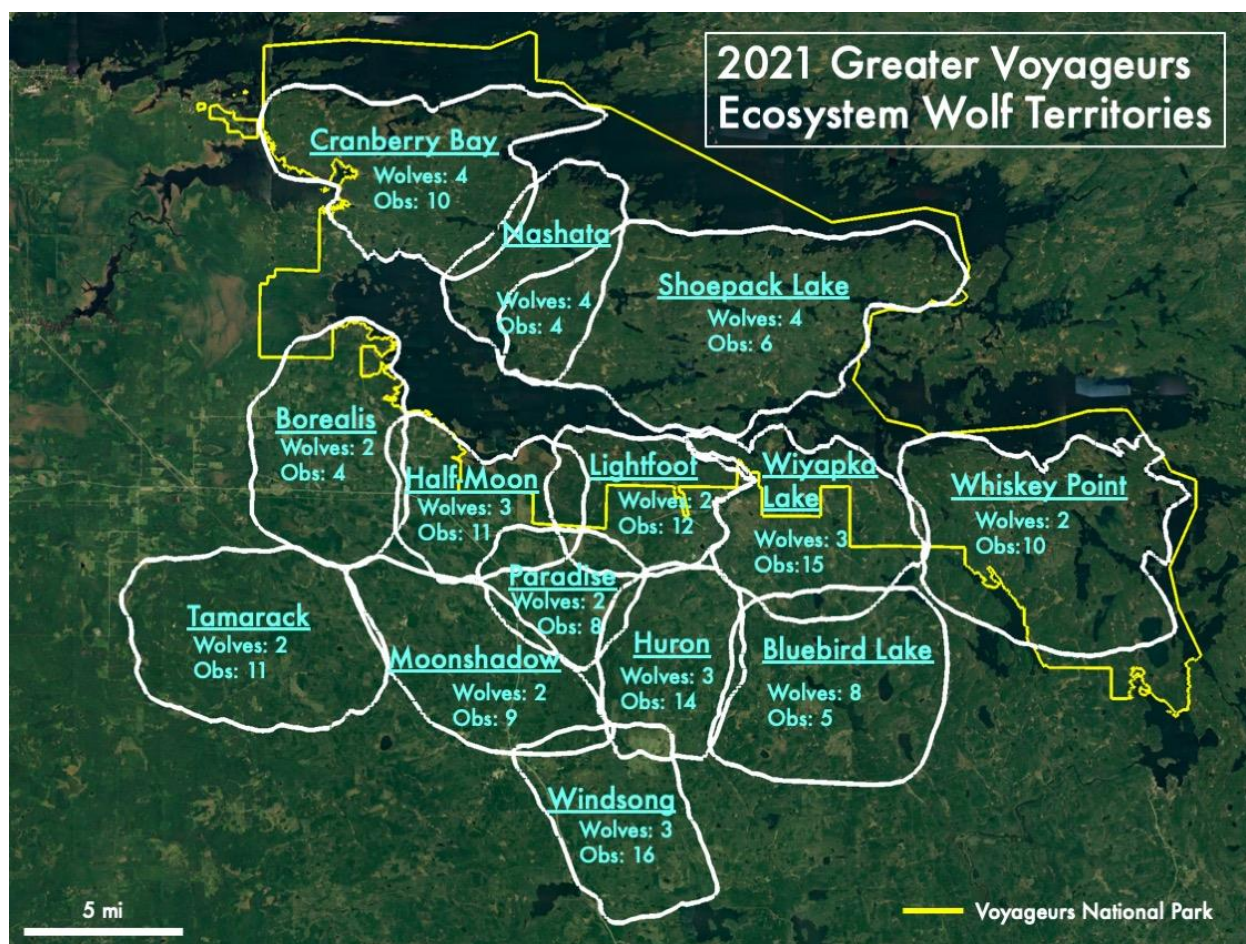


Figure 1. Wolf pack territories in the Greater Voyageurs Ecosystem during Winter 2020-2021. The number of wolves in each pack is listed after “Wolves:”. “Obs:” refers to the number of independent observations of that pack at that given size during Winter 2020-2021. Territories of Shoepack Lake, Borealis, Tamarack, Bluebird Lake, and Whiskey Point are all based on either historical pack territories or our best estimates given neighboring territories. We did not use these territories for any estimates of population density or pack territory size.

Average pack size was 3.1 wolves during Winter 2020-2021, which was a slight increase from Winter 2019-2020 when average pack size was 2.9 (Fig. 2). However, pack size was still significantly less than the long-term average of 5.0 wolves from 2000 to 2018. Average territory size was 78 km², which was smaller the historical average of wolf territories in the GVE.

Overall, population density remained high with an estimated density of 45.7 wolves/1000 km². This estimate assumes that pack wolves occupy all terrestrial landscapes in the GVE (3.1 wolves per pack/78 km² territory*1000 km²= 39.74 pack wolves/km²) and that the density of lone wolves in the GVE is 15% of the population of pack wolves (39.74 wolves/km² * 0.15= 5.97 lone wolves/1000 km²).

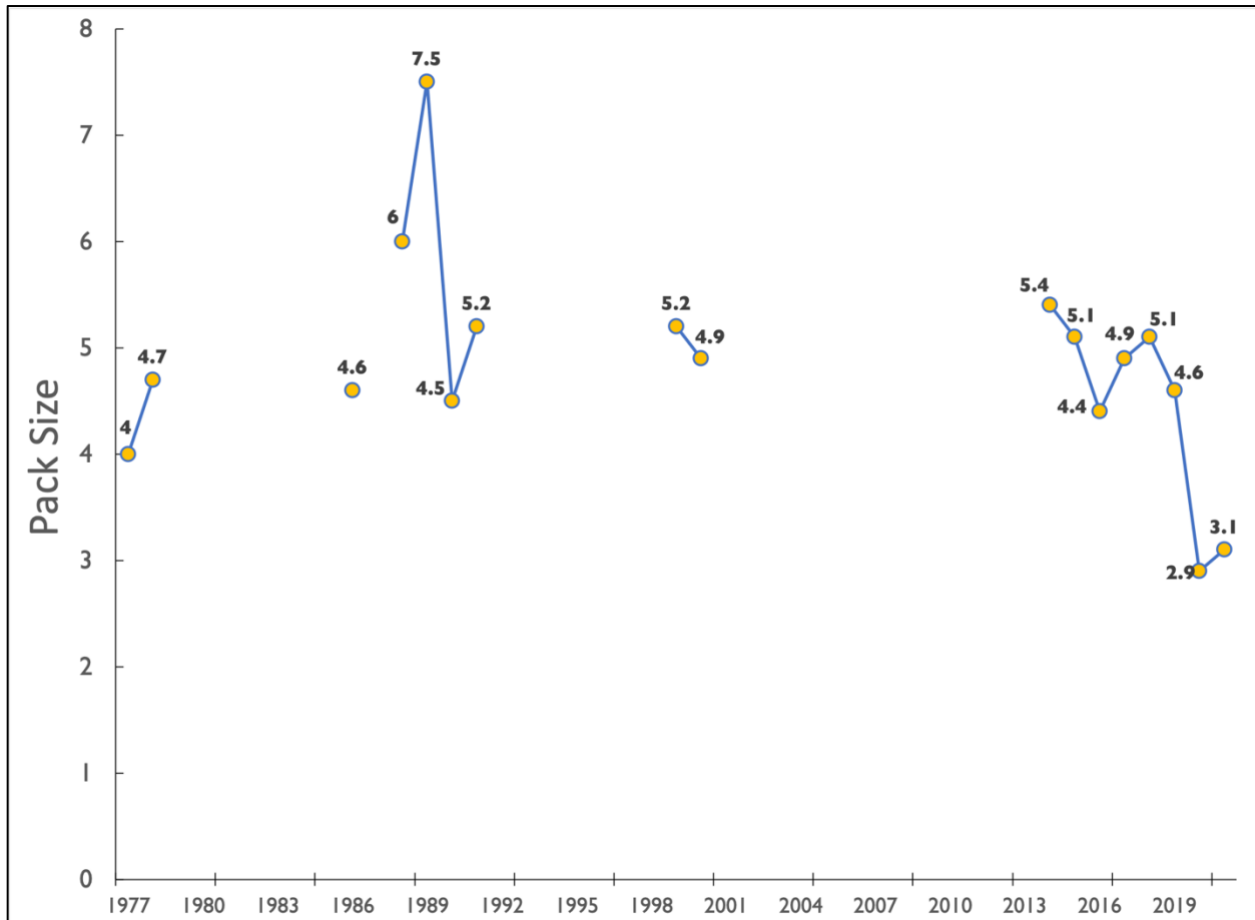


Figure 2. Wolf pack size estimates for the Greater Voyageurs Ecosystem during 1976 to 2021. All estimates are from winter observations (tracks, visual observation, trail cameras, etc.) of wolf packs. Estimates prior to 1989 should be treated with caution as they are based on scant observations of a small number of packs.

The reduction in pack size over the past 2 years is almost certainly a result of extremely poor pup survival rates (<20-25%). However, it is possible that the wolf population compensated for this by reducing pack territory size, which in turn, allowed more packs to occupy portions of the GVE. Indeed, despite reduced pack size and poor pup survival, the population density remains quite high.

In addition to pack size and population estimates, remote video cameras deployed year-round and intensive spring to fall fieldwork have facilitated a more detailed understanding of pack composition, pup survival, and known individuals. All of this makes it much easier to understand pack size during the winter and the wolf population of the GVE as a whole.

SUMMARY OF INDIVIDUAL WOLF PACKS

BLUEBIRD LAKE PACK

We did not intend on estimating pack size for the Bluebird Lake Pack but several fortuitous observations of this previously unknown pack on the edge of the Huron and Wiyapka Lake territories allowed us to estimate pack size. What was particularly helpful is that one of the wolves in this pack was ear-tagged and collared. Luckily, we got one excellent photo of the collared wolf which showed it was wearing an all-black Vectronic collar that only had a box below the neck (Fig. 3). The collar had a Telonics drop-off on the side and the wolf's ear-tag was partially readable with the 3rd digit on the tag clearly a "5" (Fig. 3 & 4).



Figure 3. A photograph of a collared wolf from the Bluebird Lake Pack near Bridge 3 on the Moose River Grade in November 2020. Using the ear-tag and collar make/model, we were able to determine that this was Wolf V052 who we lost contact with in October 2016.

All of this provided enough to figure out that this was Wolf V052 who we collared in the Sheep Ranch Pack in Spring 2016 as a yearling. V052 was fitted with a Vectronic GPS Plus collar that had a Telonics drop-off installed. The collar was supposed to drop-off in October 2016 but the drop-off failed. T. Gable observed V052 still wearing this collar in late October 2016 while flying aerial beaver surveys, which confirmed the collar had not dropped off. This

was the last time we observed V052 until this past year (i.e., we lost track of her for 5 years). We suspect that V052 is the breeding female of this pack given her age.

Our first observations of the Bluebird Lake Pack were in October 2020 at Bridge #3 on the Moose River Grade where we captured trail camera photographs of V052 and other wolves. Up until this point, all wolves on our trail cameras on the Moose River Grade were Wiyapka Lake Pack wolves. However, we captured Bluebird Lake Pack wolves on camera numerous times during Fall 2020 suggesting that they were starting to use or takeover portions of the Wiyapka Lake territory. A series of photos from this location in November 2020 showed V052 traveling with 8 other wolves, two of which were clearly wolf pups.

We are quite certain this pack occupies the Bluebird Lake/Long Lake area because all observations of this pack to date have been on the eastern edge of the Huron territory and the southern edge of the Wiyapka Lake territory. I.e., the most logical conclusion is that this large pack with pups occupies the territory to the east of Huron and south of Wiyapka. It is highly unlikely that this is a nomadic pack because 1) we did not capture the pack on any of the other 125+ cameras deployed in our study area during fall or winter and 2) they had 2 wolf pups in tow.



Figure 4. A close-up of Wolf V052 on December 25, 2020. The numbers “52” can barely be seen on the edge of the ear-tag. V052 was traveling with 8 other wolves at this time.

Although we are pretty certain about what the general area this pack occupies, we are less certain about the size of this pack, largely because it seems the pack size changed throughout the winter. In the beginning of winter it was clear that the pack was 9 wolves as we had observations of 9 wolves on Dec 3, Dec 25, and Jan 10 (there was a clear observation of 9 in November as well). By mid-January, the pack appeared to be 8 wolves as we had observations of 8 on Jan 21 and Feb 12. On March 8, we got an observations of 7 wolves but the camera lens was fogged

over and it was challenging to make out some wolves. It is possible the pack was 7 wolves by then or it is possible that we just could not make out an 8th wolf. Unfortunately, this was the last observation of this pack during winter.

All of this suggests that the pack had 9 wolves at the start of winter but likely lost a member to dispersal or death by mid-January resulting in a pack of 8. At a minimum the pack was 7 wolves in March but could still have been 8 wolves. Given the uncertainty, our official “estimate” for this pack is 8 wolves as we do not feel comfortable concluding, based on one low quality observation, that the pack was 7 wolves.

BOREALIS PACK

The Borealis Pack had 2 pack members—presumably a breeding pair—this winter. Trail camera footage in Spring 2021 showed a lactating female in this territory. We got 4 observations of this pack traveling together during the past winter despite only having our trail cameras deployed for a little over a month in this territory. Given this, we are fairly confident in this pack count estimate. We have not studied this pack before and do not have a precise territory boundary for the pack yet. However, this pack is clearly westerly adjacent to the Half-Moon Pack and north of the Moonshadow Pack given where this pair was traveling and where our cameras were deployed. In the pack territory map (Fig. 1), we have estimated what is likely the general territory of the Borealis Pack based on where other pack territories are.

CRANBERRY BAY PACK

We had 10 observations of 4 wolves in the Cranberry Bay Pack during Winter 2020-2021. Wolves V083 and V084, the breeding pair, were present in all 10 of these observations. Thus, the pack is V083, V084, and two subordinates. V084 was clearly in estrous as she had a swollen, bloody vulva in several observations during the winter.



Figure 5. A Cranberry Bay Pack pup (center) with its mother, Wolf V084, behind it.

The Cranberry Bay Pack was larger in December. We had an observation of 6 wolves in early December and two observations of 5 wolves in late December. However, by January there were only 4 wolves observed in the pack suggesting that some pack members either died or dispersed in December.

We had an observation of another pack of 4 wolves that intruded into the Cranberry Bay Pack territory on February 7, 2021. One of the wolves in the pack was almost entirely white and none of the 4 animals were ear-tagged or collared. This was the only observation we had of this pack but it clearly was not Cranberry Bay.

HALF-MOON PACK

The Half-Moon Pack was 3 wolves in Winter 2020-2021: Wolf V094, his mate, and a subordinate wolf. In total, we had 11 observations of these 3 wolves together during this time. The Half-Moon Pack had 4 pups in Spring 2020 and we ear-tagged all 4 pups. However, we suspect that all of these pups died because the subordinate wolf traveling with V094 and his mate does not appear to be ear-tagged.

While we did get several observations of these 3 wolves traveling together throughout the winter, we started to get quite a few observations of just V094 and the breeding female together in late February and March. We suspect that the 3rd pack member was likely exhibiting some pre-dispersal behavior (e.g., disassociating from the pack). I.e., we think this is likely similar to V095's pre-dispersal behavior this spring. Such behavior would make sense because the subordinate member of the Half-Moon Pack would be at least 2 years old and thus the typical age of a dispersing wolf.

In October 2020, the Half-Moon Pack was 6 wolves, two of which were pups. Sometime between October 2020 and mid-December 2020, the pack was reduced to three wolves. We suspect both of the pups died and then Wolf 2217—a 2.5 yr old subordinate wolf who was ear-tagged as a pup in the Bowman Bay pack but somehow joined the Half-Moon Pack—either died or dispersed during this period.

HURON PACK

We are a bit unsure what exactly occurred in the Huron Pack during October 2020 to January 2021. During most of 2020, Wolf V034 and his mate had been leading the Huron Pack (note: V034 and his mate were the breeding pair of the Bowman Bay Pack for 4 years before taking over the Sheep Ranch territory further south). Wolf V093 was a subordinate in this pack that we collared in Spring 2020. The pack produced at least 3 pups in 2020 that made it until early fall. Remote camera footage showed an unknown ear-tagged wolf traveling with Huron Pack members in summer and fall of 2020. This wolf was not part of the pack during the previous winter.



Figure 6. The breeding female of the Huron Pack in early April. She is clearly pregnant and suspect she gave birth within a few days of this photograph. This female was also the breeding female of the Bowman Bay Pack from 2016 to 2019 where she produced 4 litters of pups.

November 2020 was the last time we observed V034. We had relatively few observations of wolves during November or December 2020 in general. In early January 2021, Wolf V093 was attacked and killed by wolves on the western edge of the Huron Pack territory. Right around this time, we had two observations (Dec 25 and Jan 10) of a large wolf pack traveling down the South Spur of the Camp 90 Road, which is toward the eastern side of the Huron Pack territory. We assumed that a new pack had taken over this territory. However, we only got two additional observations of this large pack in the Huron territory (one in February and one in March) and both observations were on the periphery of the Huron Pack territory suggesting this pack was not occupying this territory. Instead, we learned that this intruding pack was the Bluebird Lake Pack to the east of the Huron Pack territory (see Bluebird Lake Pack description above).

Furthermore, we got several observations of 3 wolves together in the Huron territory in February and March 2021. One of the three wolves was clearly the breeding female of the Huron Pack (Fig. 6), another wolf was ear-tagged (Fig. 7), and the other wolf was a large male. V034 was not with the pack. A clear video of the ear-tagged wolf revealed that this was Wolf V082 who was a female wolf born into the Sheep Ranch Pack but who then became a lone wolf when the Huron Pack took over the Sheep Ranch Pack territory in January 2020 (Fig. 7). We suspect V082 was the unknown ear-tagged wolf that was observed traveling with Huron Pack members in summer/fall of 2020. How V082 ended up a member of the Huron Pack is a mystery!



Figure 7. Wolf V082 in March 2021. A very fortuitous photo which allowed us to read one of the ear-tags. Wolf V082 is a subordinate wolf in the Huron Pack.

In total, we had 14 observations of the same 3 wolves during February and March 2021. The breeding female was clearly pregnant in several videos in late March and early April. We suspect that Wolf V034 likely died or was killed sometime in late 2020 or early 2021. The breeding female, V034's mate for 5 years, then quickly found another mate. We confirmed that the pack produced a litter of pups this spring (Fig. 6).

LIGHTFOOT PACK

The Lightfoot Pack was just a pair (Wolf V071 and his mate) in Winter 2019-2020 but in April 2020 they had a litter of 7 pups. However, none of the 7 pups survived past November 2020 and the Lightfoot Pack remained two wolves during Winter 2020-2021. We had 12 observations of this pair traveling together during Winter 2020-2021. The Lightfoot Pack has remained small since it took over the Ash River Pack territory in 2017, likely due to low pup survival.

MOONSHADOW PACK

The Moonshadow Pack did not have any pups in Spring 2020 so we suspected the pack would be a pair this winter and we were correct. The Moonshadow Pack was two wolves this winter: Wolf V079 and a female wolf (Fig. 8). V079 and Wolf V072 had been the breeding pair in Moonshadow in 2019 but the pair split in early 2020, after which V079 found a new mate and

continued to occupy the Moonshadow territory while V072 became a lone wolf (and has remained that way ever since).



Figure 8. The breeding pair of the Moonshadow Pack scent rolling in front of our camera. Wolf V079 is the wolf in the back. His collar and ear-tags were not visible in this photo but were clear in other photos taken during this observation.

Trail camera footage confirms that the Moonshadow Pack was again 2 wolves in Winter 2020-2021. The two wolves being V079 and his mate, which is likely the female wolf he paired up with in 2020. In total, we had 9 observations of this pack during the winter. The female wolf was clearly in estrous during the winter and we confirmed that she had pups this spring.

Worth noting: Wolf V079's collar functioned until October 2020 when the collar died (likely battery failure). The collar provided us with the home range of the Moonshadow Pack during this time.

NASHATA PACK

The wolf packs on the Kabetogama Peninsula are very challenging to study given the difficulties of collaring wolves in this area and the fact that there are not many linear features to put trail cameras on (i.e., it is difficult to predict where these wolves travel without linear features and thus challenging to get observations of these packs). All of this to say, it was a challenge to untangle where the Nashata Pack and Shoepack Lake Pack territories began and ended and how many wolves were in each pack.

To the best of our knowledge, the Nashata Pack formed sometime in late winter or early spring of 2020 when Wolf V074 left the Shoepack Lake Pack in Winter 2019-2020 and started localizing in the middle of the Kabetogama Peninsula. V074 was a subordinate wolf in the Shoepack Lake Pack prior to leaving. The area V074 localized was the “no man’s land” between the Cranberry Bay Pack and the Shoepack Lake Pack. V074 was observed traveling with two other wolves in March 2020 suggesting that he was likely part of a pack. Subsequent trail camera observations during late winter and spring 2020 showed V074 frequently traveling with other wolves but not with members of the Shoepack Lake Pack so far as we could tell.

In July 2020, V074's collar quit working and we lost our ability to monitor his movements. However, we deployed numerous remote cameras in the presumed Nashata Pack territory in hopes of learning more about this "new" pack. Fortunately, these cameras provided us enough information to understand the pack structure and size during Winter 2020-2021.



Figure 9. The breeding pair of the Nashata Pack on a snowmobile trail just west of Shoepack Lake. The breeding female is the wolf to the far right and the male in the center of the photo.

The Nashata Pack was 4 wolves in Winter 2020-2021. This included the breeding pair, V074, and another subordinate. Based on the behavior of pack interactions in the video footage, we are quite certain that V074 is not the breeding male of the Nashata Pack. Instead, the breeding male appears to be another large male that has a distinctive appearance (including a washed out gray coat). The breeding female is also a very distinctive looking wolf and quite easy to identify in video footage (Fig. 9). Her reddish-orange coat is particularly obvious when compared to her packmates. Video footage shows that this female was in estrous during the winter meaning she will likely produce pups this year (Fig. 10).



Figure 10. The Nashata Pack breeding female with swollen vulva in January 2021. This suggests that this female/pack will produce a litter of pups in Spring 2021.

We had 4 observations of 4 wolves in this pack during December 2020 to February 2021 (observations on 12/12, 12/27, 1/24, and 2/11). We did have two observations of 5 wolves in early December but we suspect the 5th member either left the pack or died because we never observed more than 4 wolves together after December 12, 2020.

Trail camera footage suggests that there might still be significant overlap between the Nashata Pack territory and the Shoepack Lake Pack territory. For example, both packs routinely used Nashata Beach, which would likely be toward the center of the Nashata territory, in late fall and early winter. It is possible that territorial boundaries are still getting sorted out amongst these packs now that Nashata has taken up residence in part of the Shoepack Lake territory.

PARADISE PACK

The Paradise Pack was 2 wolves (Wolves V077 and V085) in Winter 2020-2021. The Paradise Pack had formed in January-February 2020 and the pair produced 4 pups in April 2020. However, all 4 pups had died by July 2020. For a while it appeared that the pair was dissolving following the loss of the pups.

Yet by Fall 2020, V077 and V085 were traveling around together and this continued into the winter. We have 8 observations of this pack during Winter 2020-2021 confirming that the Paradise Pack is still just V077 and V085. We also confirmed that the Paradise Pack produced pups this spring (2021).



Figure 11. Wolf V085 the breeding female of the Paradise Pack in spring after giving birth to a litter of pups.

SHOEPACK LAKE PACK

The Shoepack Lake Pack was the most perplexing pack to estimate the size of this winter because pack size changed throughout the winter. Fortunately, we were able to identify a clear pattern of pack size change because we captured 37 observations of the pack (i.e., 2 or more wolves traveling together) during the winter.

It is worth noting that we thought the Shoepack Lake Pack had dissolved in early 2020 as we did not observe the breeding pair (Wolf V036 and her mate) on any trail cameras after January 2020. Instead we only captured a pair of wolves traveling in this territory from January to March 2020. We assumed this pair was a new pack which we called the “Beast Lake Pack”.

Remote cameras deployed in Summer 2020 demonstrated we were clearly wrong about this. The Shoepack Lake Pack was still in existence with V036 and her mate still the breeding pair. We had 3 or 4 observations of 5 adult wolves traveling together during the summer. Three of the 5 adult wolves were easily recognizable: V036 with an ear-tag, her mate which is an old whitish-gray wolf, and a subordinate wolf with a short, deformed tail. Two wolf pups were also observed traveling with the pack in the summer (total of 7 wolves).



Figure 12. The Shoepack Lake Pack in November 2020 when the pack was still 7 wolves. Wolf V036 was the second wolf from the front and the breeding male was the wolf to the left of her with the white-ish face. By mid-January, the pack had decreased to 4 individuals.

In November 2020, the Shoepack Lake Pack had 7 members (Fig. 12)—which included V036, the breeding male, and the short-tailed subordinate—but by early December the pack was only 6 members. The pack still had 6 members by mid-December when we got two observations of 6 wolves traveling together on December 18 and December 19. Shortly thereafter the pack had decreased in size and 5 wolves were observed traveling together on December 26, January 12, and January 17. Wolf V036, the breeding male, and the short-tailed subordinate were 3 of the 5 members. Shortly after January 17 the pack decreased in size as all subsequent observations of this pack showed 4 wolves traveling together (6 observations of 4 wolves on Jan 20, Jan 23, Jan 31, Feb 2, Feb 19, and Feb 21). V036 and her mate were two of the four wolves but the short-tailed subordinate was no longer traveling with the pack suggesting that the wolf either dispersed or died sometime around January 17-January 20.

V036 was clearly in estrous in a video from January 28, 2021 as her vulva was swollen and bloody. Thus, we were able to confirm that there were 3 females in 3 packs on the Kabetogama Peninsula who were in estrous during January and February 2021. The females were: V084 from the Cranberry Bay Pack, the female from the Nashata Pack (Fig. 10), and V036 from the Shoepack Lake Pack.

TAMARACK PACK

The Tamarack Pack had 2 pack members this winter, which are presumably a breeding pair. We got 11 observations of this pack traveling together despite only having our trail cameras deployed for a little over a month in this territory. Given this, we are confident in this pack count estimate. We have not studied this pack before and do not have a precise territory boundary for the pack yet. However, this pack is clearly westerly adjacent to the Moonshadow Pack given where this pair was traveling and where our cameras were deployed. In the pack territory map, we have estimated what is likely the general territory of the Tamarack Pack based on where other pack territories are.

WHISKEY POINT PACK

The Sand Point Pack territory was a “disputed” territory for most of 2020 it seems. Up until 2020, Wolf V042 and his mate had been the breeding pair of the Sand Point Pack for at least 2 years and potentially as long ago as 2015 (Fig. 13). Wolf V042 was collared in Fall 2015 and was a member of the pack in that territory in 2015 to early 2016. We do not know if he remained in this pack from 2016 to 2018, and if so, what his breeding status was during this time.



Figure 13. The Sand Point Lake Pack, which was just a breeding pair, that was replaced by the Whiskey Point Pack in December 2020. The top wolf is Wolf V042 who was collared in the Sand Point Lake Pack territory in Fall 2015. V042 was the breeding male of the pack for at least 3 years. The bottom wolf was his mate.

In Winter 2019-2020, the Sand Point Pack was only two wolves as none of their pups survived. However, in early 2020 we started getting video footage of another pair of wolves traveling around in the Sand Point Pack territory (Fig. 14). These two animals were readily distinguishable from V042 and his mate. We continued to get video footage of V042 and his mate as well as this other pair throughout the Sand Point Pack territory during 2020. Notably, however, we never got these two pair of wolves traveling together during this time even though we have numerous observations of each pair in 2020.



Figure 14. The Whiskey Point Pack in late February 2021. The breeding male is the wolf facing the camera and the breeding female the wolf facing away. The breeding female's vulva is swollen and bloody indicating she is in estrous.

The last observation of V042 and his mate was in December 2020. All observations of wolves in the Sand Point Pack territory after that were of this new pair. Based on this, it is clear that the Sand Point Lake Pack territory turned over during December 2020-January 2021. We named the new pair/pack that took over this territory as the Whiskey Point Pack (Fig. 14). In total, we had 10 observations of the Whiskey Point Pack during Winter 2020-2021. The female of the pack was in estrous in some of the videos providing good evidence that this is a breeding pair that will produce pups (Fig. 14).

WINDSONG PACK

The Windsong Pack is a new pack (i.e., a new breeding pair) that is occupying the old Fawn Crick Pack territory. The pack turnover occurred sometime last summer or fall. The breeding male of the Fawn Crick Pack territory was killed for depredation reasons last summer and we suspect this caused the dissolution of the Fawn Crick Pack. However, Wolf V087, who was a 1-2 year old subordinate wolf—and likely offspring of the deceased breeding male—in the Fawn Crick Pack in 2020, took over the territory and found a mate (Fig 15).



Figure 15. Wolf V087, the breeding male of the Windsong Pack, on the Fawn Crick Road in December 2020.

The Windsong Pack was 3 wolves this winter: V087, V087's mate, and 1 subordinate wolf. We captured and collared the subordinate wolf (Wolf O0C) this spring. Intriguingly, this wolf was a pup that we tagged at the Fawn Crick Pack den in May 2020. In other words, this Wolf V087 and Wolf O0C are likely siblings but from different litters. During the pack turnover, Wolf O0C remained with V087 and V087's mate.

We had 16 observations of 3 wolves traveling around together in this territory. Given the number of observations and ability to identify individuals in the pack, we are very confident in our pack size estimate.

WIYAPKA LAKE PACK

The Wiyapka Lake Pack was 3 wolves this winter: Wolf V076 (breeding female), the breeding male, and Wolf V095 (1.5 year old offspring of V076 and her mate). The Wiyapka Lake Pack had the same three individuals in Winter 2019-2020 (last year). The pack composition remained unchanged because all 6 of the Wiyapka Lake Pups in 2020 died before this past winter. We found remains of 2 of these 6 pups during fieldwork in 2020.

We were able to get 15 observations of this pack throughout the winter. In March, V095 started to display some pre-dispersal behavior. Specifically, 1) V095 stopped traveling with

V076 and her mate but remained in the territory and 2) V095 started doing extra-territorial forays. On April 6, V095 finally dispersed and he has not been back to the territory since.

We have several videos of V076 and her mate traveling together without V095 in March. Because V095 was still in the territory we considered every observation of V076 and her mate in March a count of 3 wolves in the Wiyapka Lake Pack (the breeding pair plus Wolf V095 who was still in the territory).

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