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MUNICIPAL MUSK OXEN By

GENTRY ADDISON HALE

Bachelor of Science, University of Utah, Salt Lake City, Utah, 2019

Thesis

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Approved by:

Scott Whittenburg, Dean of The Graduate School Graduate School

> Nadia White, Chair Journalism

Ray Fanning, Co-Chair Journalism

Chad Bishop, Co-Chair Wildlife Biology Hale, Gentry, M.A., May 2023

Environmental Science and Natural Resource Journalism

Municipal Musk Oxen: 50 Years After Reintroduction, Increasing Conflicts Raise Questions About Musk Ox Management in A Small Alaskan Town

Chairperson: Nadia White

Co-Chairperson: Ray Fanning

Co-Chairperson: Chad Bishop

You'd be hard-pressed to find a town with more sled dogs and mushers per capita than Nome, the finish line of the 938-mile Iditarod sled dog race.

It is also home to a growing herd of musk oxen, massive ungulates that Congress reintroduced to the Seward Peninsula in 1970. These icons of the far north have changed little over their 1.8 million years of existence and more closely related to sheep and goats than actual oxen.

While musk oxen pose a risk to dogs and people, they are also a major tourist attraction that helps inject much needed outside cash into the local economy. But that tolerance quickly frayed after a large bull gored and killed an Alaska State Trooper in December 2022—the first recorded instance of a musk ox killing a person in North America.

With a subsistence hunting season already in place for these animals, the Alaska Board of Game responded by more than tripling musk oxen harvest numbers to 30 for the upcoming season in Nome in an attempt to instill a fear of humans back into the animals. However, some residents worry that it is not enough to turn the tide or that killing so many more animals may cause a cascade of other issues.

More than 50 years after Congress restored musk oxen to Alaska's Seward Peninsula, residents of Nome are struggling to agree on how best to manage what have become one of the largest nuisance animals in the global north. Early in the summer of 2021, dog musher Kirsten Bey drove her truck up a dirt driveway in Nome, Alaska, to her sled dog yard. A large, male musk ox with missing one of its massive, hooked blocked her path—he was an animal notorious for killing multiple dogs in the area. As Bey reached for her phone to call the police, the ox lumbered into the dog yard where Bey's eight Alaskan huskies were tethered to their poles.

Winters are long and harsh in Nome, a small coastal town on Alaska's Seward Peninsula defined by dog mushing and gold mining. The snow had finally melted enough for Bey to erect a makeshift fence barrier made from dog pen panels—her attempt to keep musk oxen out of her sled dog yard. But unfazed, the one-horned ox pushed right through it.

Though the sled dogs were tied up and unable to harm him, the musk ox lowered his head and charged, knocking one of them on its flank, luckily using his hornless side. Then he turned and began plowing through dog houses.

Bey watched in horror as he moved across her property, knocking another dog again with his hornless side. Their barks rang out as they ran in circles on their tethers, helpless to evade the 800-pound animal tearing through their yard.

Nome Police officers arrived. The ox had paused his rampage, and as officers trained their guns on it, Bey rushed to secure the rest of her pack. One dog had a fatal lung injury and later had to be put down, while another suffered a cracked rib.

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How Did Musk Oxen Get to Alaska?

Five feet tall and weighing up to 800 pounds, musk oxen are scattered throughout Greenland, Canada and the Alaskan Arctic. Hunters are believed to have eradicated the animals from Alaska in the 1800s.

In 1930, Congress gave \$40,000 to the U.S. Biological Survey to bring musk oxen from Greenland back to Alaska. Five years later, wildlife managers moved 34 of those animals to Nunivak Island, 30 miles off the coast of the Yukon Delta. Collaboration

between the U.S. and the island's native Yupik people of the village of Mekouryuk made the introduction successful, and the animals have been used for food and fur since.

In 1970, the Alaska Department of Fish and Game transplanted 36 musk oxen from the Nunivak Island herd to a spot about 35 miles northeast of Nome on the Seward Peninsula. Then another 35 were released near Teller, about 72 miles from Nome, in 1981.

Both moves raised the ire of mainland Alaskans, who said ADFG failed to consult or even inform local people about either release on the Peninsula. They were stunned to find these unfamiliar beasts suddenly roaming around, without any formal plan about how they might hunt them or otherwise benefit from their presence, much less live alongside them.

As a result, musk oxen on the mainland were perceived as a nuisance by some rather than a resource. The original 71 animals have grown to nearly 3,000 on the Seward Peninsula.

About a decade ago, the musk oxen started to enter Nome's city limits. They might have been avoiding predators or attracted to the lawns and gardens, but now, after generations of breeding in and near town, many animals have become habituated and lost any fear of humans.

There's No Place Like Nome

Claudia Ihl (pronounced Eel) stepped out of her car on an August afternoon at the local high school. A herd of almost 20 musk oxen calmly munched on lush willows adjacent to the playground.

A resident musk ox expert, Ihl is conducting research through the University of Alaska - Fairbanks on the nutritional quality of musk oxen forage and she is ultra-aware of where the herds tend to be at any given time. She moved to Nome permanently in 2006 but had been researching the animals on the Seward peninsula just north of Nome since the '90s. Over the years, Ihl has accumulated a great deal of knowledge about musk oxen movements, patters and nature.

Ihl says most Nome residents think that musk oxen have found solace living in Nome because of safety from bears, which prey on the oxen and their calves. But she's not convinced of that.

State wildlife officials recently conducted a study that found predation accounted for around 60% of the deaths of GPS collared calves, mostly by grizzlies. But data also showed that their proximity to town held no safety net. Grizzly bears killed musk ox calves near Nome at the same rate as those far from town.

In thinks predation may have initially played a role in pushing musk oxen into Nome but is not the reason they have decided to stick around the residential neighborhoods. She thinks it has to do with forage.

Come for the Safe Space—Stay for the Green Space

The habitat in and around Nome has been heavily impacted by years of gold mining activity which has unintentionally created prime feeding grounds for musk oxen. Gold was first discovered in Nome in 1898, and by the next year Nome's population had ballooned to 28,000. Following 10,000 years of Inupiaq subsistence living, Nome became a rural hub for the Bering Strait in the 1900s and still is today. The population now sits at around 3,500 and some gold mining still continues.

This century-old history of human activity has in part shaped the prime musk oxen habitat in Nome. Even in town, the tundra landscape is stark. Craters and ditches—scars of historic mining—pock treeless tundra coated with thick vegetation.

Gold mining clears the thick underbrush and, eventually, new vegetation grows. This new growth tends to be the kind of vegetation that musk oxen like. Ihl said one of their favorite plants in the late summer is fireweed. Boasting a breathtaking pink-purple flower, this pioneering plant colonizes recently disturbed areas, such as roadsides, gravel pits, gravel bars, mine tailings and recently burned landscapes, hence the name. Musk oxen also love leafy willows with soft stems, young grasses, sedges and water horsetails—a relative of ferns with an extremely high protein content that grows in shallow water, which is found at the bottom of many mining pits.

Mining operations wash gravel and sediment through long chutes to sift out the finely dispersed gold. They disturb large tracts of land for a relatively small amount of gold. Some mining companies even seeded tailings with non-native grasses to help revegetate the land quickly, giving musk oxen a wider selection of foods than in the undisturbed tundra.

"This creates a mosaic of many small patches with lots of choices on a relatively small area of land," Ihl said. "Here in town, there is a particularly nice arrangement of smaller patches, so they have more choices in a smaller area, and there is a lot of newly disturbed ground."

Outside of Nome, along one of the three gravel highways that exit the town, the landscape becomes uniform, and mine tailings get further apart. Ihl says Nome is like an all-you-can-eat buffet compared to the relative monoculture of available forage on the surrounding tundra.

Ihl followed the herd to the high school because she and her students are sampling musk oxen feeding sites around town to see what they like best and analyzing the nutritional quality of what they eat. She wonders if the plants are more nutritious on the mine tailings because of the minerals in the recently disturbed soils.

Ihl said musk oxen may need variety in their diets in order to maintain a healthy rumen, a large digestion chamber with a host of microorganisms essential to digestion. "If they eat nothing but grasses for two weeks, the rumen microflora will probably change. Some of the rumen microflora bacteria that would rather have willows will diminish in population, and then when they get into some willows, they might have problems digesting them."

Ihl does not think climate change played a large role in the movement of musk oxen into town a decade ago, but in recent years it has impacted their ability to access food during the winter months. Nome sits 20 feet above sea level, surrounded by plains that begin rising about four miles south of town. Typically, musk oxen move to higher elevations in the winter months where strong winds can blow away the snow to expose the vegetation underneath. However, increasingly frequent warm spells have caused freezing winter rains, which coat the vegetation with ice and force the musk oxen to move back down the hillsides in search of forage in the deeper snow.

Uncommonly warm weather in early winter of 2022 is likely the reason that musk ox was milling around 36-year-old Curtis Worland's dog yard when his fatal attack occurred. Officer Worland was a 13-year veteran of the Alaska Court System as well as an avid hunter and angler, and no stranger to moving musk oxen away from his dog yard. Almost weekly he would hop on his ATV or snow machine and drive them off, but when he tried that on December 13th a musk ox gored him in his femoral artery and he bled to death before he could reach the road for help.

Public anger over Worland's death amplified the decade-long cries for better, more sustainable management of the big animals.

Qiviut Fever

Even though Kirsten Bey has had her share of struggles with musk oxen attacking her dogs, she relies on them. She spins fiber and knits delicate cowls and hats from qiviut, the soft underwool of the musk oxen and one of the warmest fibers on earth. Bey's mother is of Norwegian descent and taught Bey how to knit beautiful Norwegian sweaters. In 2010 Bey attended a class at the University of Alaska Fairbanks Northwest Campus in Nome on how to comb qiviut from an oxen hide, and she says it infected her with "qiviut fever".

Bey purchases hides from subsistence hunters, combs the qiviut and sends the fiber away to be processed into yarn, but it can also be collected by hand in the tundra in the spring and summer as the animal sheds. She started her own business, called Qiviut Fever, in 2011. Two years later she purchased a yarn and fabric store in Nome, which she named Sew Far North.

Now 67, Bey has been a dog musher for decades. Stoic and resilient, she carries the quintessential personality of a hardened Alaskan living in a remote tundra town. Originally from Portland, Oregon, she practiced law for nearly six years before taking a summer off in 1990 to visit friends across the country.

That adventure led her to Alaska, where she met a musher who needed help at his dog yard for the upcoming winter. After that winter she spent two more years helping with his team. While working for him, she ran his puppy team in the 1993 Iditarod race. Shortly after that she settled in Nome and put together a dog team of her own.

But it wasn't until 2016 that Bey had her first run-in with aggressive musk oxen. That left two of her dogs seriously injured, which had to be rushed to an Anchorage vet with rips in their flesh. A couple years later another of her dogs was stomped to death by a musk ox and a second suffered an injured leg.

The worst attack to date, though, came during the summer of 2019 when musk oxen killed or injured five of her dogs. Bey arrived at her dog yard, just a half-mile out of town, and found two of her dogs dead. One had been thrown 10 feet from its doghouse. A third dog was badly gored and had to be put down, and two others needed emergency medical care but survived.

Then, in 2021, the infamous one-horned musk ox tore through her yard.

Other mushers sympathize. "Everyone who has dogs in town has had run-ins with musk oxen," Bey said. Many mushers own and share dog lots, or dog yards, around town where they keep their teams, but even individual family dogs are at risk, Bey said.

"Fifteen years ago, in the fall time, when I'm training dogs after work and it's dark, it never would have occurred to me that I might run into musk ox. And now I can't even go for a walk a quarter mile outside my yard without going out on the ATV first and seeing if there are musk oxen around," Bey said.

Bey estimates she's now had more than a half dozen incidents where musk oxen injured her dogs. She now has a chain link fence around her yard to discourage musk oxen from entering, though for such a powerful animal, she knows it's not ox-proof. When musk oxen are in the area, Bey sleeps at her dog lot to protect the dogs.

"I think people do really feel like we're sort of in prison here in town because we just don't have the freedom to go out and wander and enjoy," Bey said. "But on the other hand, we sort of plopped ourselves down in the middle of this wild space."

Fines and Jail-Time for Fighting Back

Although she owned a sled team for years, Diana Adams had only one small dog named Sister in July of 2014. Adams still owned a pen at a dog lot, and she would move Sister between there and her home depending on if musk oxen were nearby.

It was morning, and Adams had seen a herd of oxen on the outskirts of the neighborhood. She quickly pulled clothing on over her pajamas and put Sister in the back of her truck then went to town to get coffee at the town's only coffee shop, hoping to give the herd time to move on. When she got back there were over 20 animals in her yard. She left Sister in the back of the truck and ran the animals off of her property onto the tundra. Just across the nearby highway, though, there was an even larger herd moving toward her home.

Adams moved Sister to the dog pen and went out on foot, yelling and chasing the animals, trying to get them to switch directions. She didn't want them coming down the neighborhood street, so she returned to her house and grabbed her unloaded 20-gauge shotgun and a few shells.

"I was just going to stay in my truck near the entrance of the neighborhood and try to keep them from coming in," Adams said. But when she went back outside after grabbing her shotgun, there was a musk ox standing beneath her front porch. So she loaded the gun with slugs and bird shot.

Musk oxen tend to stand their ground when faced with a threat, instinctively they circle up and face outward, placing the elderly and the young in the middle. They stay in that defensive huddle as long as needed, but only tend to fight with their massive horns and browband—called a boss—if attacked.

Bill Dunker, who served as area manager for Alaska Fish and Game before leaving in 2022, said that the situation in Nome is new and unique. Without a playbook, all the agency's mitigation strategies have been experimental. "Other parts of Alaska have issues with black bears or deer getting hit by cars—those are the problems I dream about," Dunker said last year.

Nome officials have tried to move musk oxen away from areas where they may pose a threat—like dog yards, front yards and airport runways—by hazing them with rubber bullets, beanbag rounds, pickup trucks, grizzly urine, shocker shells, fire hoses and more. Even the aggressive hazing techniques that would have worked with other animals have failed to keep musk oxen away.

"Musk oxen respond differently than most ungulates to stressors," Dunker said. "They are unlikely to flee from danger, their instinct is to group the herd, stand their ground and not run from a perceived threat."

It's not clear why musk oxen attack tethered sled dogs that don't pose a threat, but it is clearly a major challenge to turn a musk ox back once they do. Standing with her gun in hand, Adams screamed at the ox under her porch, but it wouldn't move. She fired a bird shot round into the air, and the musk ox ran across the street. The shot also startled another musk ox on the other side of the porch Adams hadn't noticed.

It started to run then stopped a few feet in front of Sister's pen. Stone-cold silent, Sister didn't move or bark. The ox walked calmly up to Sister and they stood nose to nose at the gate. "The fact that it didn't run or charge or act aggressive, but just quietly walked up, scared me more than if there had been more action," Adams said.

Adams had already called the city and ADFG to report the musk ox. As she stood and watched the animal stare at her dog, she contemplated calling them again but decided she didn't have time. Adams had lost a dog the year earlier to a musk ox. "When they go to tear something up, the first thing they do is drop their head," Adams said. She set her phone down and put a bead on the animal, The second it dropped its head, she started shooting.

"I hit her behind her right shoulder, she spun, I hit her behind her left shoulder, then she crossed the street then dropped," Adams said. "I called the city and said that I just shot a musk ox off my dog and they'd better send somebody. All I wanted to do was to finish drinking my coffee."

NPD came first, then ADFG. "I just remember a lot of people standing around and looking at me and I knew I was in trouble. And honestly, I didn't care. I just kept looking at my dog thinking, I still have a live dog. She doesn't have her guts ripped out of her. She doesn't have gore marks, she's not on her way to Anchorage; she is alive and well. This is a good thing. It was awful watching a wild animal die like that, but that fact that I had a live dog, I was okay with it."

Alaska state law requires that if someone shoots an animal without a tag and in defense of life or property (DLP) they must fill out a DLP report and salvage the animal, then turn the meat and hide over to state officials.

Otherwise, the only way Alaskans can legally shoot a musk ox is to apply for a Tier 2 subsistence tag, only given to a small number of long-time Alaska residents who need the meat to survive.

Adams was told immediately to clean the animal, or she would face wanton waste charges, a Class A misdemeanor for not salvaging edible meat for human consumption after killing a big game animal.

So, Adams had friends come clean and quarter the animal then donated the meat to the local senior center. Next, she called a lawyer.

Adams was ticketed with a \$10,000 fine and a year in jail for poaching—illegally taking an animal out of season. Her court date was set for October.

Adams had been vocal to officials about her views that musk oxen were being mismanaged prior to the incident and said that as she told her story to law enforcement in the immediate aftermath, she could tell officers were suspicious of her DLP claim.

The trooper who issued the ticket was new in town, and according to Adams, he told her more than once that if she went public and admitted that she shouldn't have shot the animal he would drop the charges, but Adams refused.

Just a few weeks after she had shot the musk ox to protect Sister, on July 26th, she got a call from Mitch Erickson, a musher who shared her dog lot. Something had happened and his dog Onslo, who was one of Sister's littermates, was missing.

Adams rushed to the scene and eventually found Onslo in a shallow pond about 150 feet from the lot, his entrails and organs tangled across surrounding willows. He was

still alive and clamped his jaw on Adams' arm as she entered the pond, trying to pull himself out. There was no hope of untangling him—he had to be shot.

The officer who had issued her the ticket a few weeks prior arrived, too. He found Adams bleeding from her arm and sobbing. "I want to think that the tossed house, the broken chain, the destroyed pen and the blood and tissue left behind humbled him to what we were up against with these animals," Adams said.

Three days later, the trooper came to Adams' house to tell her that he was dropping the charges.

"I like to think he learned a lesson that day. I hope he learned that nobody else should have to go through this with their dog. I think he understood," Adams said. "Everyone who's had a horrendous situation with a musk ox has this story. And those people who've had injured or mortally wounded dogs have the same story, the horror and the trauma. That story doesn't change. The story never gets better."

Diana Adams has since moved from Alaska to Oregon, and she doesn't think that things in Nome are going to change. "They didn't change after Emerson got hit, and people kept saying that it'll take somebody getting hurt. Well, Emerson got hurt. It'll take somebody getting killed. Well, Curtis got killed. Do I really think anything's going to change? No."

Before Curtis Worland was killed, Emerson Conger was the only person around Nome to have been attacked by a musk ox.

He was trying to move his dogs safely away from an ox in his yard when it lowered its head and charged him.

"The animal came up, and luckily it used the plate of its forehead instead of the actual horn. It made contact on my quad and threw me about a good 10 feet or so," Emerson said. He was still holding the dogs so he heaved them forward to get them to safety.

Musk oxen were nothing new to Emerson. His mother, Annie Conger, is a native Inupiaq woman who remembers when musk oxen were first brought to the Seward Peninsula.

Annie is from Brevig Mission, about 75 miles from Nome. When the musk oxen were released near her home, the village didn't know what to do with them. Although the long spit of land where Annie grew up was one of the primary trade fairs pre- and post-European contact, her relatives had no knowledge of musk oxen before they were reintroduced.

"When they first brought them in, they landed them at Port Clearance on the ice. Our young men didn't know how to get them out," Annie said. "They were just standing on the ice for I don't know how long without eating and the village was afraid they were going to starve. So they tried to shoo them to get them off of the ice to the land so they could go and eat. But they were afraid inside at the same time because they didn't know the animal's characteristics or how they would react."

Annie worked for Alaska Fish and Game doing subsistence studies around the state before becoming an elementary educator. She and her husband moved from Brevig Mission to Nome in 1998, and Annie still teaches at the local elementary school.

Even in Nome, Annie continues the practice of subsistence foraging. Among the plants she gathers are fireweed blossoms, which she uses to make jelly. The musk oxen have grazed and trampled huge swaths of the plant. She said she feels overjoyed when she finds it growing where musk oxen haven't gotten to it yet. Other indigenous Alaskans

near Nome complain that the berry fields which they have historically foraged for centuries have been trampled by musk oxen herds moving through the area, destroying food sources on which they rely.

Good Fences Make Good Neighbors

Fences are a hot topic amongst Nome mushers. With the town being so isolated (and treeless), shipping in fencing materials is extremely expensive. In winter, fences get buried in snow drifts, which defeats their purpose. And musk oxen sometimes trample right over the fences and get themselves stuck in dog yards, unable to find their way out.

Sue Steinacher worked for ADFG for seven years as an Education Associate, helping communities and villages throughout western and northern Alaska work more collaboratively with ADFG on wildlife management concerns. She retired in 2009 but has remained vocal about ways to keep people, kids and dog teams safe from musk oxen. She is a former dog musher herself but doesn't mind having musk oxen in town.

Steinacher has worked as a musk oxen tour guide in the past and has seen firsthand how musk oxen boost Nome's economy. As local herds have increased, so have tourists, who are now coming in on cruise ships full of people wanting the chance to see a musk ox in the wild.

When she and her husband first bought their property in Nome they constructed tall, stable fencing around their backyard to keep her dogs safe and have not had any issues with musk oxen getting through it. She believes the musk ox that charged Emerson Conger had become aggressive only after getting entangled in a cable that had been strung as an ineffective deterrence.

Steinacher is puzzled when mushers are hesitant to protect their animals. She assumes it's because Alaskans have never had to fence their dogs before, while mushers in places like Europe see fencing as a common practice. She thinks Alaskan dog owners just need to learn how to adapt to the current circumstances in places like Nome.

"You can argue about why the muskoxen never should have been transplanted here, and how it's Fish & Game's responsibility to remove them, but at least for the present, this is our reality," Steinacher said. "Mushers spend thousands of dollars on food and gear and equipment and vet bills for their dogs, so why resist investing in adequate fencing?"

Old mining poles, called thaw pipes, are abundant in Nome and a perfect material to build a stable, effective fence at little cost, Steinacher said. She has seen similar fences be used to contain bison.

She also says that spraying musk oxen with a hose is a quick and effective way to move them off your property, and a method she's employed many times to move large bulls away from her and her neighbor's yards. She wishes others like Kirsten Bey would get more proactive in protecting their yards.

"Kirsten Bey loves dogs and is so good-hearted, but she has never installed effective fencing, and has lost too many beloved sled dogs to muskoxen. It just baffles me."

Tony Gorn, ADFG's regional supervisor of Nome agrees with her frustration. ADFG has worked closely with the community to help protect residents, their dogs and their yards from musk oxen, Gorn says. But for some people "there's almost no personal accountability... some people choose to put a little effort in on their part and address the problem. And others, I think, just appear to hope that the problem goes away."

Lethal Measures

Under pressure from Nome residents following Officer Worland's death, ADGF has decided to triple the number of musk oxen to be hunted in and around Nome beginning this year.

Historically, regulations have allowed subsistence hunters to kill five bulls in the inner Nome area and four bulls in the outer Nome area each year. Hunters are restricted to using bow and arrow, muzzleloaders or shotguns on the hunt.

In 2023, the ADFG will raise quotas from nine to 30 animals, allowing the taking of 15 in the inner and 15 in the outer Nome areas. For the first time since 2011, it will be legal to hunt female musk oxen. A total of 10 females will be available, split between the inner and outer Nome areas.

Some locals who generally support increased subsistence hunting around Nome are concerned that the hunt poses a risk to the musk oxen population and will do little to solve conflicts because it's happening outside the high-conflict months. Their proposals range from tightly limiting the cow hunt to late summer and early fall when most conflicts occur to restricting the frequency that subsistence hunters can receive permits in order to grant more hunters the experience.

Tom Gray, a member of the Northern Norton Sound Advisory Committee, which sends recommendations to the Alaska Board of Game, worries that this dramatic increase will wipe the musk oxen population out completely. Sara Germain, the ADFG area biologist, told a reporter at the Nome Nugget that the increase in harvest was done specifically to reduce human-musk oxen conflict while allowing the 22C musk oxen population to continue increasing, just at a lower rate.

ADFG's Tony Gorn admits that they don't know what the result of the change will be, if any. "It's going to be an experiment," said Gorn, because musk oxen can easily move 100 miles throughout the summer, causing major distribution changes. They stay relatively put during the winter but when summer comes "the whole deck is reshuffled as animals start moving again," he said.

Because of this movement, he doesn't know what the effect will be on populations in Nome. "You just can't be for sure that were going to see a reduction in local numbers... we may find that animals want to continue to be here and we can't just lower the population by increasing harvests by a little bit."

Nome residents Miranda Musich and Sarah Swartz disagree that ADFG has invested subsequent effort to address the local musk oxen problem. In an attempt for change they formed the Reform for Rural Alaskan Muskox Management group. They have a petition with nearly 1,500 signatures demanding change in the management of musk oxen, as well a dossier containing data, articles, management documents and personal accounts of musk oxen interactions.

Musich has sent the 80-page dossier to state and federal representatives to inform them on what they feel is the real story of what is happening in Nome. Although increasing hunting permits was one of their proposed solutions, Musich worries that state officials will feel they've done all they can to help Nome by increasing quotas and won't make any further changes. "Hunting to thin numbers in Nome is a good first step, but we still need to discuss other management strategies and methods for moving problematic groups of musk oxen," Musich said.

The document proposes investing in other efforts such as training local law enforcement officers on effective and non-lethal ways to move herds, equipping and educating local volunteers on how to safely move herds when officials aren't available, increasing research and data gathering on musk oxen, creating a musk oxen farm to gather and sell qiviut while supporting tourism, and creating forage plots outside of town to draw musk oxen away.

ADFG has no comment on the potential of these propositions.

Fifty years after musk oxen were introduced to Alaska, their future on the landscape remains in question and their relationships with the people who live closest to them is fraught. ADFG plans to conduct its next population survey of musk oxen in 2024, which will help managers reevaluate the increased quotas.

Musich and others in town feel frustrated at the lack of response that they have gotten from ADFG and other officials, and hope that someday everyone can work together to find a lasting, impactful solution.

"We have the special opportunity to co-exist with a prehistoric animal, said Musich. "However, the critical term is "co-exist". Right now, that is not happening."

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