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Borriela Burgdorferi is the bacterium that causes Lyme disease (CDC). It has a spiral shape, making it a part of the Spirochete bacteria family (Penza et al. 2016).

Ticks that carry this bacterium are able to spread it to humans by biting them, leaving the human infected. It is most commonly found that humans contract Lyme disease through ticks that are in the nymph stage because they very small and hard to spot. People are also able to contract the disease from the full grown Black Legged ticks, but that is less common because people can spot them and are able to take them off their body in enough time to not be infected by the bacterium (CDC). The most common sign that a human has been infected with Lyme disease is a distinct " bullseye" rash called the Erythema Migrans (EM) rash. Other symptoms can appear along with that such as aches, muscle and joint pain, and feeling feverish. If these symptoms go untreated, severe headaches, arthritis and even inflammation of the brain can occur (CDC). The disease is able to be treated with antibiotics if it is in the early stages (CDC). Other animals such as deer, rodents and birds are involved in the spread of Lyme disease (Millins et al.

2017; Wright et al. 2000). Small mammals, mainly rodents, are responsible for infecting over 80% of nymphs and ticks. Having high amounts of these mammals can lead to a higher amount of infected ticks. These animals are serving as hosts for the ticks and reproductive grounds, increasing the possibility of Lyme disease in humans (Levi et al. 2012). Closer to cities, patchy woods are more prevalent.

In these areas, mice and rodents have higher populations here, making it easier for Lyme disease to be spread (National Science Foundation). This is one reason Lyme disease is a particular concern for people who live in Minnesota at this time. Another reason this should be a concern is because according to Taal and other authors, " Lyme disease cases have increased by 380% in Minnesota". The purpose of this study relating to these findings, is to decrease the spread of Lyme disease in public parks Minnesota by managing populations of certain animals in Tamarack park in Ramsey County. Methods: In this study, we used a simulation model. The simulation model included the forest tick host species of: white footed mouse, eastern chipmunk, red and grey squirrel, short-tailed shrews and other shrews, white tailed deer, raccoons, opossum striped skunk, red fox and coyote. The variables that we included were burden, survival and competency of each species.

In this model, we were able to change the abundance of each species in the population from 5-100% of the maximum amount of each mammal per hectare. If the one of the bold species were reduced to a certain percentage, the other 2 would need to be reduced for the same. This also goes for the italicized species. If the abundance was changed for one, the same percentage of abundance had to be changed for the other. The outputs of the model are based on the changes in the species abundance/ reductions are NIP (nymphal infection prevalence), total nymphs, total infected nymphs, and total hosts per hectare. Changing the abundance of the species was able to change these outputs based on a specific series of equations. Our

goal for these simulations was to get the lowest number of total infected ticks per hectare.

Our simulations were 1: no action in reducing any species, 2: reducing deer completely, 3: reducing opossums, raccoons, and skunks completely, 3: 20% abundance rodents and shrews, 4: 20% abundance of rodents and shrews, and 80% abundance deer and raccoon, and 5: 50% abundance rodents, 40% abundance foxes and no coyotes. We chose to have the lowest prevalence of the rodents and shrews because they are the main mammals that infect the ticks (Levi et al. 2012). We performed these simulations in order get the lowest number of total infected ticks, while getting the most feasible and viable option.

We are doing this to lower the transmission of Lyme disease.