

Can Prescribed Burning Strategies Increase Moose Calf Winter Survival Rates?

Background and Motivation:

Moose populations in Vermont have been declining rapidly by 40% from 2010-2017 due to loss of habitat, direct human influence, and the increased prevalence of parasitic stressors on calves. Among brain and lungworm, perhaps the most impactful is the winter tick. Winter tick populations have been proliferating due to milder and warmer winters, allowing them to strain calf populations enough to drop their winter survival rate to a mere 49% (DeBow 2020). Winter tick is responsible for 74% of moose fatalities and 91% of calf winter mortality (VTFWS 2019).

Vermont's moose population is aging, birth rates are dropping, and calves' survival rates are lowering to a point where the population will be challenging to sustain. To aid the increasingly stressed population, prescribed burning, which is known to drastically impact tick populations, could be a viable population management route.

Hypothesis:

We hypothesize that with prescribed burn management targeting winter tick in key moose habitats will equate to less tick caused strain.

Sites that are managed through burning will transmit less ticks to moose, and as a result will produce healthier browsing conditions for both adults and their offspring to survive the winter.

Methods:

Site Selection

Victory State park is a mix of marsh and swamp bordered by highlands, an ideal habitat favored by moose populations. It is also within Essex county, the county with the highest moose population in Vermont. Game cams will be invaluable to locate frequently trafficked areas and determine the ideal location for burns.

Plot structure

Plots will be nested and fit one of four categories: control (UBUB), burned surrounded by unburned (BUB), and burned surrounded by burned (BB), and unburned surrounded by burned (UBB). Plots will be $\frac{1}{4}$ mile in area, with an interior plot area of $\frac{1}{8}$ mile. See figure 2

Tick Collection

Plots will be sampled with a 1x1 meter cloth flag for an hour each per month and checked for ticks every 10 minutes. Nymphs and adults will be preserved in 70% ethanol. If more than five ticks have been sampled, an additional 30 minutes of sampling will occur or until the plot is finished sampling.

Collared Moose Monitoring

Monitoring current collars in the area and collaring moose and calves that haven't been sampled yet in Victory State Park. Moose will be not observed for tick counts, but survival rates and assessing if the result of death was due to ticks.

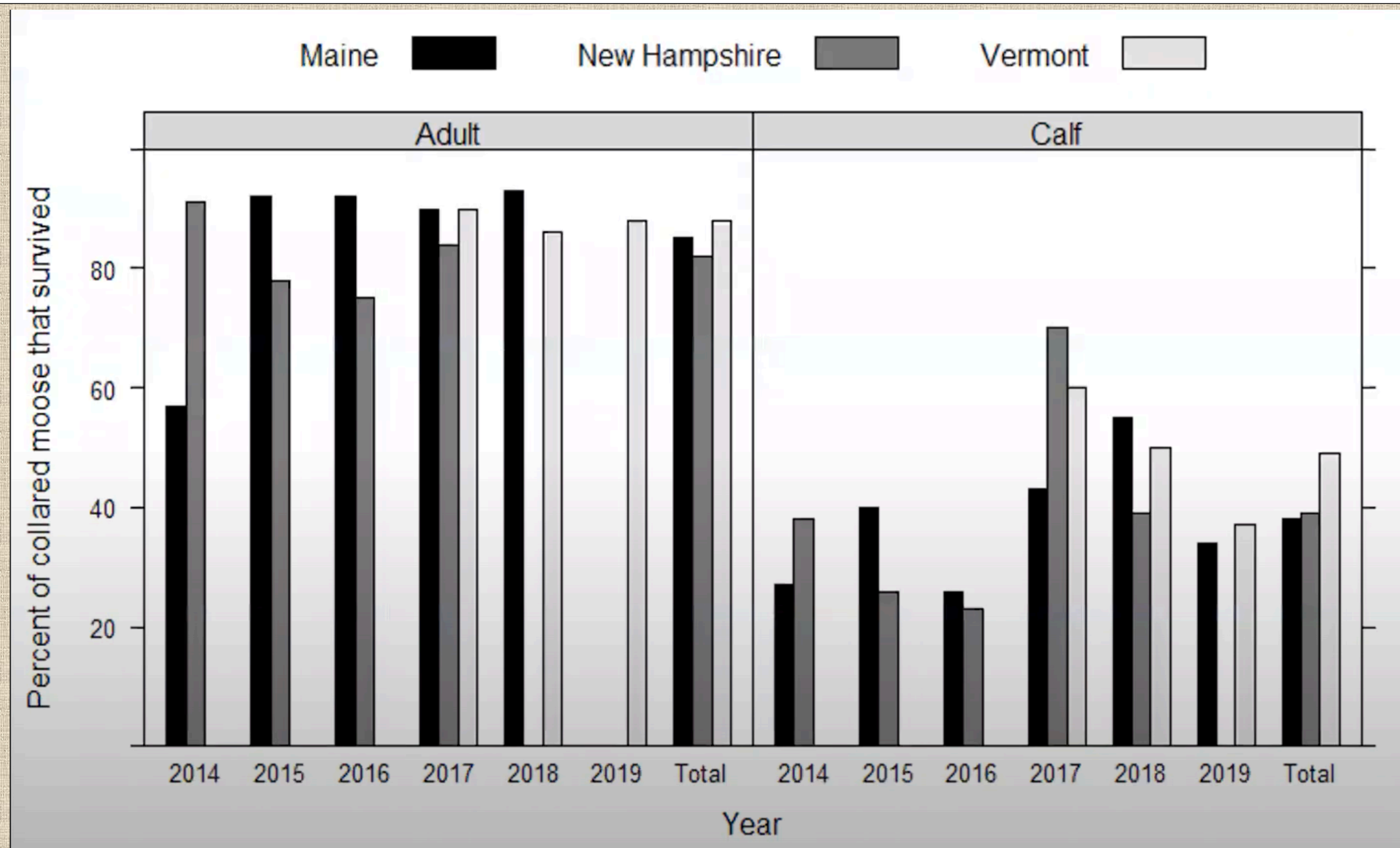


Table 1: Winter survival rate of new England moose Mature vs. Calves. From Jake DeBow lecture on winter ticks' impact on moose population

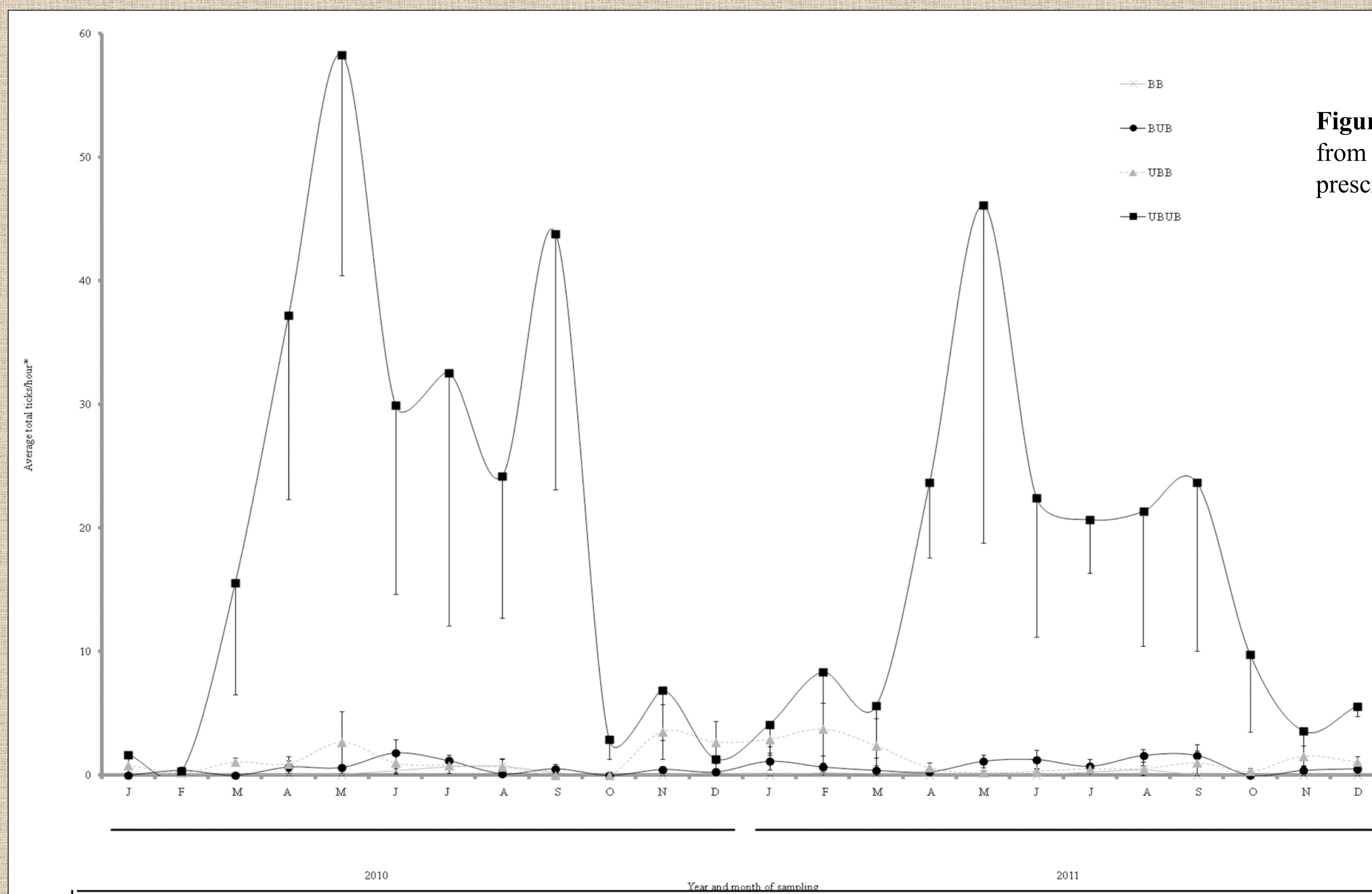


Figure 3: Tick populations from 2010-2011 in areas with prescribed burning

	Treatment	adult		nymph		larvae (clutches)	
		2010	2011	2010	2011	2010	2011
<i>A. americanum</i>	BB	0	1	0	0	0	0
	BUB	4	7	2	21	1,362 (1)	291 (2)
	UBB	5	4	24	4	2,354 (2)	1,177 (5)
	UBUB	272	170	1,171	981	26,432 (147)	12,433 (72)*
<i>A. maculatum</i>	BB	30	6	1	0	0	0
	BUB	25	6	0	1	0	0
	UBB	3	2	0	1	0	0
	UBUB	0	3	0	0	0	unknown*
<i>I. scapularis</i>	BB	2	3	0	0	0	0
	BUB	8	18	0	0	0	0
	UBB	40	94	1	0	0	0
	UBUB	47	128	5	1	5 (1)	0
<i>D. variabilis</i>	BB	0	0	0	0	0	0
	BUB	9	2	0	0	0	0
	UBB	7	2	0	0	0	0
	UBUB	13	5	0	0	0	0

BB = Burned, surrounded by burned, BUB = Burned, surrounded by unburned, UBB = Unburned, surrounded by unburned, UBUB = Unburned, surrounded by unburned.
*1 group of 40 larvae (not included in the numbers in this table) thought to be a single clutch was found to contain both *A. americanum* and *A. maculatum* upon PCR testing.
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Figure 1: Female winter ticks engorged on moose. Photo from Jake DeBow researching effects of winter ticks on moose survival rates

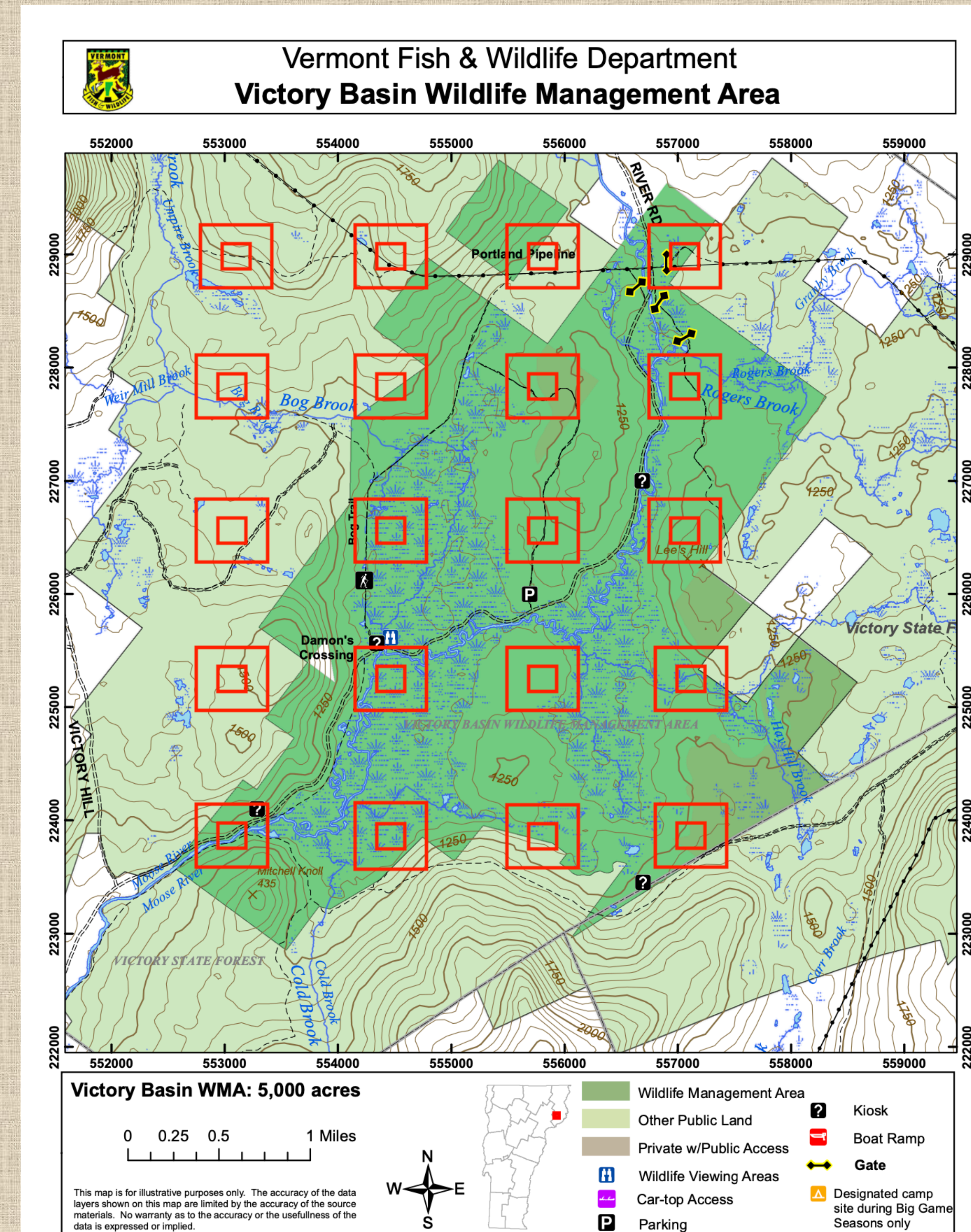


Figure 2: Proposed sites of management in Victory State Park, they are nested, alternating between: UBUB, BUB, BB, UBB. Map from the Vermont Fish and Wildlife Department.

Intended Analysis:

We expect burning will help the winter survival rate of moose calves and provide more food to the ecosystem. Rapid sprouting will be from the burning of species like beech and aspen that root sucker vigorously when damaged. The abundance of buds in burned areas will help other species that browse on buds like grouse and deer. The type of habitat burned in Victory park will matter since it varies between upland and marsh so drastically, but prescribed burns have a significant impact on ticks regardless. That variability will need consideration.