

Moose heaven is a valley

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Through the 1950's when the best job in Canada was mine, much of my time and thought was aimed at answering the question, "what is a moose?" We knew from the start that a full answer would always be beyond the ken of man, but it was exciting to be able to add a few chapters to what was known. Not that we uncovered much that was new; we mostly found just new variations of old truths because we worked in a different sort of place. But our explorations did give us an unusual opportunity to fashion some understanding of a spectacular animal living in wild and beautiful mountains.

The Clearwater valley, our laboratory, is not impressive on the map, but it carries a lot of water out of some usually wet mountains, and it does so with a rush and a roar, a frothing and boiling that is constant through most of its steep fall. It begins in high mountains encased in glaciers. It ends in the low valley of the North Thompson. And while its upper reaches drain a chaotic and largely unexplored region of high rocks and ice, the lower part with the most moose is a kinder land of broad valleys among domed mountains with forested sides and alpine meadows across their broad tops.

In this geological setting flourished a population of about 2000 moose, their abundance demonstrating the suitability of the valley to satisfy the particular needs of this one species. The first answer to our employer's question, "what is a moose?" was obviously that a moose in an animal so designed that conditions in the Clearwater valley are well suited to it. Almost at once we were not only studying moose, we were also examining those conditions suitable to the moose. Ecology took over. From the first the study was not of moose so much as it was of a landscape of which moose were an important part, for a moose, like most things alive, is made from a landscape recipe calling for particular sorts of rocks, climates and living things.

We found also that a moose is an animal that dies in deep snow. As a northern animal, moose are designed to survive through snowy winters, but even their long legs can cope with only so much snow. Up to three feet of it may not be serious. Four or five feet of it can immobilize them. Three feet of it can be serious if it is heavy, not because it stops the animals, but because moving about in it to gather food can require the spending of more energy that is obtained in the food collected. Such a deficit budget for energy can lead to starvation.

In the Clearwater valley the moose's answer to the snow problem was to move out when conditions threatened survival. It was a short, steep valley with the high end cold and wet, the low end warmer and drier. Most moose lived in summer in the spruce forests at high elevations. Every winter the snow was deepest in the high end of the valley, shallowest down low, and through the winter the snow deepened rapidly at the high end, slowly at the other, much as the space beneath a board steepens as it is raised from the ground by only one end. Through the winter the moose were moved down the valley by the deepening snow, most animals favoring the depths under three feet. In general there was a reluctance to move. In a winter of shallow snows they might be moved barely out of the spruce forests, but a winter of deep snows might roll them on another twenty-five miles down the valley, the snow keeping them on the move slowly downward all winter. In spring their reluctance to be so low was

especially evident during rapid thaws, when quickly disappearing snow caused them to move rapidly up the valley, crowding the snow depths only just acceptable for easy travel. In a few days, hundreds of moose could hurry up the valley over ground used through two months of winter. If the thaw stopped, the migration stopped; if rapid melting resumed, so did the trek of the moose. Why they were so eager to be back at high elevations was a mystery. [TG: THEY WERE SITTING DUCKS FOR PREDATION BY WOLES WHILE IN THEIR WINTER RANGE. XXX] Perhaps it was simply that spruce forests were “home”. Clearly, however, a moose is a spruce forest animal, although in this valley snow made them move out in the winter. In biology, there are exceptions to most rules; we did find moose that failed to migrate. Most perished. The annual migration was clearly a matter of survival.

Not only did the lay of the land and the gradient of climate down the valley allow the moose to easily step down from winter conditions that became lethal, but when they moved down from the spruce forests they entered a vast burn filled with food for moose. In a recipe for bread you will find that it is made of a little of this and a little of that, but mostly it is made of flour. Similarly, we found in the Clearwater valley that a moose is made of a little of this and that, but mostly it is made of willow. And in winter although the snow rolled moose down the slopes and down the valley, it pushed them into a world literally filled with a favorite food. Forest fires had swept the lower elevations of the Clearwater valley in the 1920's, over large areas completely eliminating forests trees like Douglas fir, red cedar and alpine fir. In about the 200 square miles of burn the most common woody plant was willow. Over most of this large area it was difficult for a moose to stand anywhere that was more than twenty feet from a vigorous willow bush. We calculated that this extensive brush land had over half a million willows per square mile.

These were “moose-sized willows”. Most were either large enough to remain above the snow yet low enough for a moose to reach, or were limber enough to be bent or broke down. Few willows had grown into trees beyond the reach of moose because the moose themselves constantly broke them over while feeding in cold weather.

Moose are browsers; they eat the tender stems and leaves of trees and shrubs. As gardeners known, willows can put on rapid growth, and they hold tenaciously to life even after severe damage. We found the Clearwater valley to be remarkably productive moose pasture. In each of those 200 or so square miles, willows were producing about 7,000 miles of new stems per year, and moose were eating, each year, about three quarters of this annual mileage. Late each winter the heavily browsed pastures were composed of battered and broken willow bushes thoroughly clipped by the hungry animals. They missed no accessible bushes. Yet the willows thrived on it, and we found this annual mutilation stimulated them to produce even more growth the next summer. This ecological relationship between willow and moose was the secret of moose abundance in the valley, this, plus the patterns of topography and snow depths that pushed the moose down through ranges they would not otherwise have utilized. They were forced reluctantly into their annual migrations, but the result was the use of more land with more resources for making moose. If they were allowed to remain at the same elevation winter and summer, such would not be the case. Reluctantly, it seems, the moose were forced into the fuller use of the valley's resources, and the result was more moose.

I found the scale of this interaction between the willow and the moose to be awesome and difficult to comprehend. Our knowledge of it was confined to one valley, and it was but one ecological strand in the web of the valley's complex ecology, but this one relationship became so vast after a little looking and a little thinking, that we felt small in the face of it all. I remember once standing on the rim of this valley and ignoring for a time the great sweep of dramatic scenery as I became lost in arithmetic. There before me was a recipe for making moose. In 200 square miles of slowly healing burn were a hundred million willow bushes producing each year about one and a half million miles of new growth. Each year over a million miles of those willow stems were consumed by 2000 moose, each eating about 50 pounds per day. Think of it. Two million pounds of moose were built, repaired and powered by the partial conversion, daily, of 100,000 pounds of vegetation, most of it tender, but woody, willow stems. And this was a living process, able to go on with minor variations year after year. The only sign that it could not go on forever was the little Douglas firs beginning to appear among the willows. Those firs would destroy the recipe for the moose, slowly replacing the willows and so erasing the moose that the willows were making.

Clearwater moose lived in a complex web of living and non-living thing. They were touched by swamps and bear, by nematodes and river, by ice, and robins, and wolves, and men. But mostly they were touched by willow which made them successful, and they were going to be touched more and more by Douglas fir which would cause their failure. It is a truth as old as life that population success and failure are a matter of environmental excellence. And even man, for all his cleverness, is still bound by the same law.