Moose habitat experiments evaluated

by Brandon Miner

Moose management is one of the most important resource issues on the Kenai National Wildlife Refuge. Opportunities for consumptive (hunting) and nonconsumptive (viewing, photography) uses of moose attract a large number of visitors annually. Moose provide a food base for several predator and scavenger species. Moose are the primary prey for wolves, and moose calves are an important prey time for black bears and brown bears. Many smaller mammalian and avian predators and scavengers such as wolverine, coyotes, lynx, balk eagles, ravens, and magpies scavenge winter-killed and predator-killed moose.

During winter, moose on the Kenai Peninsula feed predominately on shoots and branches of birch, aspen, and willow. These hardwoods grow quickly after a forest fire, but after several decades they are usually overtopped and shaded out by spruce, which grows more slowly and is shade-tolerant.

In the 20th century, two major fires on the Kenai Peninsula in 1947 and 1969 created excellent winter moose habitat. The 300,000 acre 1947 burn in the central Peninsula created record high moose numbers in the late 60s. The 80,000 acre 1969 burn north of Kenai and Soldotna is still a prime moose hunting area, but population estimates from aerial surveys conduced during the 90s indicated that moose numbers declined in this area (from 6.2 moose/square mile in 1990 to 2.4 in 1995).

Many long-time residents of the Peninsula are familiar with past habitat management activities conducted on the Refuge in order to produce better winter range conditions for moose. The Refuge began habitat management in 1954, and through the 1980s thousands of acres of forest were mechanically manipulated by a variety of methods, ranging from handpulling of black spruce to the use of large 40-ton tree crushers. The tree crushers were impressive machines with 3 large steel wheels that knocked down trees and broke them into roughly 3-foot lengths. The tree crushers were used in the 1970s on over 9,000 acres of land in both the 1947 and 1969 burn areas to stimulate sprouting of hardwoods and reduce competing spruce trees, and to scarify the ground for browse species seedling establishment. From 1983 to 1987, approximately 3,500 acres of 1947 burn regrowth were crushed in three parcels in the Skilak Loop and Lily Lake areas; all but 600 acres were subsequently burned using prescribed fire.

I recently conducted a forest regeneration and moose browse study on 10 different sites that had been burned, crushed, or burned after crushing, from 11 to 52 years in the past. We found that browse (aspen, birch, and willow) regeneration was excellent at the sites that were both crushed and burned with prescribed fire, and these areas contained an average of 19,000 stems/acre of browse species. This regeneration was even better than the 1969 burn, which averaged 14,000 stems/acre. Browse densities at the sites that were only crushed contained an average of only 6,000 stems/acre. Clearly, fire is the key "added ingredient" for good browse production.

Different kinds of fire produce different results. We found that the teo most severely burned sites (the 1969 burn and a crush-and-burn site in the Skilak Loop area) contained the highest birch densities. Birch is a prolific producer of winged seeds that can be carried great distances by the wind. The severe fires burned away the duff layer and exposed mineral soil, which is ideal for germination of birch seed.

Aspen on the other hand like a more gentle fire. We found aspen densities were greatest at moderately burned sites (the Lily Lake crush-and-burn site and a second crush-and-burn site in the Skilak Loop area). Aspen thrives after fire because of its great capacity for reproduction by root suckering and most aspen stands are clones of one or several sexually produced individuals. Tens of thousands of suckers per acre are commonly produced when aspen stands are killed by fire. In my research I did not attempt to estimate clone size, but in general clone sizes are small, ranging from a few trees covering less than 0.02 acre up to about 4 acres (although clones occupying up to 200 acres have been found in Utah). A light to moderately severe fire promotes suckering, but a severe burn can eliminate aspen because the roots are "cooked" and killed.

We found that willow was relatively rare at the survey sites, but willow resprouts vigorously from the root crown and is rarely killed even by severe burns,

so the number of resprouting willows will be approximately equal to the number present before fire.

The key advantage to crushing a forest before burning is to get the fuels on the ground so that they can dry out before burning. Pre-drying the fuels created a hotter fire that exposes more mineral soil and provides birch seeds a place to germinate.

To examine how moose utilize browse vegetation I conducted moose browse surveys at several of the study sites, and summarized 15 years of previous browse data from the 1969 burn and the crush-and-burn sites. As expected, we found that percentage of aspen, birch, and willow browsed was lowest in the sites that were 30 years post-burn or older. The percentage of plants browsed was lowest at the 1947 burn sites and the percentage of plants browsed at the 1969 burn sites is declining. The percentage of plants browsed in the early-successional crush-and-burn sites in Skilak Loop was still relatively high in 1999.

Although willow is considered the preferred moose food, willow is relatively scarce, and birch is the principal winter moose food on the Kenai Peninsula because it is most available and palatable. Where present, aspen is also an important winter food. As expected, we found that moose preferred willow above birch and aspen. Between birch and aspen, we found that moose preferentially browsed the less abundant of the two species. Evidently, just like humans, moose prefer a little variety in their diets.

So, what can we expect moose populations to do in the future on the Refuge? With the continued absence of a large-scale forest fire, we can expect moose populations to decline in the central Peninsula as the 1969 burn habitat matures. Compared to the 1947 and 1969 burn areas, the crush-and-burn sites are very small and will not affect moose populations on a landscape scale. The Refuge has a prescribed burning program in the Mystery Creek area, and weather cooperating; perhaps a good burn in this area will generate some hardwood browse and improved moose hunting. Even so, a much larger burn of many tens to hundreds of thousands of acres would be needed to return moose population sizes to the "golden era" of the 1960's.

Brandon Miner recently completed his Master's thesis evaluating the Refuge's crushing and burning programs for moose habitat over the last 45 years. Previous Refuge Notebook columns are on the Web at http://www.fws.gov/refuge/kenai/.