



**Rocky Mountain National Park
Continental Divide Research Learning Center**

Beaver-Elk Relationships

The Question: Has the large number of elk contributed to the decline of beaver in the park?

Park records show that since the 1940s, the beaver (*Castor Canadensis*) population in Moraine Park has declined from several hundred to several dozen. Much of this decline has been attributed to trapping that continued in some form through the 1960s. However, since beaver have been protected from trapping, the population has not rebounded.

Beaver activities have profound effects on ecosystems including altering water flow and groundwater distribution. Alteration of the timing and duration of available water also affects the establishment and survival of willow (*Salix sp.*) and other plants with deep taproots. Willow is important in the diets of both beaver and elk, and this study examined the relationship between the browsing habits of these animals and the growth form exhibited by willow.

Park managers are concerned about beaver and willow because healthy willow communities are centers of biodiversity, and the activities of beaver are a key to creating such communities. For this reason, beaver are often referred to as a keystone species. They create habitat used by a wide variety of birds, insects, and mammals.

The Project: Test the hypothesis that the vigor and growth form of park willows is governed by whether elk or beaver are the dominant foragers.

Following a prior assessment of the Moraine Park ecosystem, Bruce Baker, of the U.S. Geological Survey in Fort Collins, and a team of co-investigators formulated a hypothesis that stated that the vigor and morphology of willows is governed by whether elk or beaver are the dominant users. Elk prefer browsing on the growing ends of willow shoots, resulting in low growing, dense shrub-like willow clumps. Beaver select tall shoots that provide them with ample bark because of the larger size of the tall branches. If elk numbers are high, willows will not produce tall, long shoots, and beaver will suffer. If elk numbers, hence browsing, are reduced, at least some willows will produce taller, longer shoots favorable to beaver. To test this hypothesis, Baker and his colleagues compared willow regrowth three years after simulated beaver cutting on paired plants with and without intense elk browsing.

The Results: Experimental results suggest that heavy elk browsing on willows results in exclusion of beavers and a change in the surrounding ecosystem.

The results of the 3-yr study supported the researcher's hypothesis. Intense elk browsing resulted in willow plants that were severely hedged and short, with a high percentage of dead limbs. In contrast, willows that were cut to simulate beaver browsing but protected from elk by fences were tall, highly branched, and leafy with a low percentage of dead limbs. Projecting these results, the investigators inferred that a reduction of elk would reduce the adverse impact of their browsing on willow, allowing the willows to regenerate to a growth form suitable for beaver, and enhance the possible return of more beaver. In contrast, continued overbrowsing by elk will likely adversely impact the beaver population especially in the core elk winter range, an area that historically supported many beaver.



Beaver are ecosystem engineers.



Beaver-browsed willow (above) are thick and tall.



Elk-browsed willow (above) are thin and short. The fence keeps elk out, so researchers can compare browsed and unbrowsed willow.

This summary is based on published, peer-reviewed and/or unpublished reports available at the time of writing. It is not intended as a statement of park policy or as a definitive account of research results.

For more information on the park's research program, see www.nps.gov/romo

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