

*Mammals and the Influence of the Columbia River  
Gorge on Their Distribution*

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**T**HIS PAPER deals with the Columbia River to the confluence of the Snake River and the latter stream to the point where it flows around the north end of the Blue Mountains, and considers these streams as they were before various dams were built. The influence of the gorge cannot be treated apart from the effect of the entire river system from the Blue Mountains to the ocean.

One would expect in the first place that the Columbia River would be a barrier for a considerable number of mammals; and in the second place that the gorge would let many mammals breach the Cascade barrier that could not go over an unbroken range.

The mammals that reach the vicinity of the Columbia River can be assigned to a number of different groups according to their distribution in relation to Oregon. Common names are taken from Burt and Grossenheider (1964). Bats are omitted.

A wide-ranging North American group extends over most of North America, but is better represented in the northern parts. Fourteen members are found in the vicinity of the Columbia River, and all have transgressed the stream. They are coyote, gray wolf, black bear, longtail weasel, mink, river otter, mountain lion, least chipmunk, beaver, deer mouse, muskrat, porcupine, elk, and whitetail deer.

A wide-ranging boreal forest group is characteristic of the coniferous forest of Canada and Alaska and ranges down the Cascade-Sierra chain and the Rocky Mountains, and is especially prevalent in the subalpine forest. Ten members are found on both sides of the Columbia River: northern water shrew, northern flying squirrel, mountain phenacomys, snowshoe hare, red fox, marten, fisher, shorttail weasel, wolverine, and lynx.

There are several wide-ranging Austral mammals that are found over most of the United States, northern Mexico, and southern Canada. Four of these are found on both sides of the river: raccoon, striped and spotted skunks, and bobcat. The gray fox has not crossed to the north bank.

A cordilleran group extends from a common base in southwestern Canada

down the Cascade-Sierra and Rocky Mountain chains, but ranges down to somewhat lower elevations than the boreal assemblage usually does. Fourteen of these are found on both sides of the river: vagrant shrew, grizzly bear, yellow pine chipmunk, yellowbelly marmot, golden-mantled ground squirrel, northern pocket gopher, bushytail woodrat, longtail vole, mountain vole, Richardson vole, western jumping mouse, pika, mule deer, and bighorn sheep. The hoary marmot does not quite reach the river from the north.

An Oregonian division is characteristic of the dense, humid forest of the northwest coast, and centers in western Oregon. Twelve are found in western Oregon and Washington: Pacific water shrew, shrew-mole, Pacific mole, Townsend mole, Aplodontia, Townsend chipmunk, chickaree, Mazama pocket gopher, California redback vole, Townsend vole, Oregon vole, and Pacific jumping mouse. Three occur only south of the Columbia River: giant pocket gopher, tree phenacomys (*P. longicaudus* + *silvicola*), and Pacific phenacomys.

The deserts, grasslands, and sagebrush areas are the typical habitats of a large group of mammals. Many enter Oregon from the Great Basin in Nevada. Fourteen of these extend down the Deschutes: Merriam shrew, badger, Townsend ground squirrel, Great Basin pocket mouse, Ord kangaroo rat, northern grasshopper mouse, western harvest mouse, sagebrush vole, pronghorn, bison, whitetail jackrabbit, blacktail jackrabbit, mountain cottontail, and pygmy rabbit. A more localized species, the Washington ground squirrel, has crossed the Snake River but not the Columbia River.

A small number of a California division, usually found in chaparral or brushy areas and in oak woodlands, enter southwestern Oregon. Two, the brush rabbit and the dusky-footed woodrat, have reached but not crossed the river. Two, the western gray squirrel and California ground squirrel, have crossed into Washington.

Thus, of 80 species found at or near the Columbia River, 68 are found on both sides, 12 are found on one side only. Of these 12, nine are of mainly southern distribution (5 are in the Oregonian and Californian groups).

Eight species have been stopped by the river below the gorge, and four have been stopped in, or in and below, the gorge.

Of the 68 that are found on both sides 52 have the same subspecies on opposite sides, 3 have different subspecies, 12 have partly the same, partly different subspecies in different parts of the river's course. Of 106 subspecies found in the species that transgress the river, 83 are found on both sides, and 23 on one side only.

The difference is even greater for amphibians and reptiles, where about 42 species are found on both sides, and only 2 on one side. The number of

subspecies common to the two sides is proportionately much larger than in mammals.

Thus it is apparent that the Columbia River is not as much of a barrier for species or even subspecies as we might expect. The question, then, becomes one of why the river is not more effective as a barrier in separating species, and in stopping gene flow between separated populations and allowing a greater number of distinct subspecies to develop on opposite sides of the river. A number of hypotheses may be postulated to explain how animals could be transferred from one bank to the other, and thus maintain some gene flow.

*Swimming.* Some animals might swim the river. But the river is broad and the current strong through and below the gorge. It is hard to imagine that very many of the small mammals and herps could make it across. The chances might be somewhat better above the gorge, especially during the slack flow of summer.

*Rafting.* This is an unlikely means. "Rafts" would consist mainly of logs and single trees, not large masses of tangled vegetation and soil; and they would be common only during flood times. They would offer little stable foothold where an animal could cling long enough to be stranded on the opposite shore.

*Ice bridges.* Even now the river above Portland occasionally freezes over, and in cooler glacial and postglacial times this must have happened more frequently. Larger animals might cross occasionally, but the smaller ones would rarely venture out on broad expanses of ice. Hibernating animals would, of course, have no chance to use such a bridge.

*Shifting channels.* Unlike rivers in flatter lands, such as the Missouri River, the Columbia River does not often change its channel so as to transfer whole sections of real estate and their inhabitants from one side of the main stream to the other.

Our knowledge of the primitive conditions of the river and of the dispersive ability of the animals is unfortunately limited. But from what we do know it is hard to understand why the river has had so little effect as a barrier.

Perhaps we can find in the past history of the area, especially in that of the last or Wisconsin glacial stage, some hint to the answer. The western edge of the coalescent cordilleran ice sheet extended across Vancouver Island and the Strait of Juan de Fuca, then southward down the Puget Sound lowland, down the Cascade Mountains to Mt. Adams, and east across northern Washington and Idaho, blocking the course of the Columbia River a little below Grand Coulee (Flint, 1957).

Climatic and vegetation belts were greatly depressed. Pollen studies by

Hansen (1947) reveal no trace of a tundra belt next to the ice front. The characteristic pioneer trees on deglaciated areas west of the Cascades were lodgepole pine and white pine, followed by Douglas-fir and western hemlock. East of the Cascades the succession was lodgepole pine and white pine, yellow pine, and chenopods and composites in drier areas. From higher elevations in the Cascades there are indications of a subalpine forest of white pine, white-bark pine, Engelmann spruce, white and alpine firs, and mountain hemlock. It would seem, then, that the main vegetation types had much the same positional relationships to each other that they have today, but that the higher belts were forced downward, and that all belts were compressed in area.

If this is correct, we can infer that with the advance of the ice animals moved downward and southward, but need not have been forced south of the Columbia River except for such groups as the wide-ranging arid land and the Great Basin groups that were adapted to a warmer and drier climate. At the height of glaciation these groups might well have retired into Oregon, or in part into Nevada. Wide-ranging North American, wide-ranging boreal, cordilleran, and Oregonian groups could have in large part persisted north of the Columbia River. (See Dalquest (1948) for a long and interesting speculation on the glacial and postglacial history of the mammals of Washington.)

Such statements are based on the postulate that a pattern of distribution very similar to the present pattern had been established before the advance of the Wisconsin ice, and that the advance of the ice simply compressed the pattern in its northern parts, and left the way open for its reestablishment as the ice retreated. They beg the question of how the pattern was formed in the first place. And they give no answer to the question of why so many subspecies are the same on both sides of the river. Perhaps if careful studies were made in the light of modern ideas of population genetics, gene pools, and gene flow of populations on both sides of the river they would reveal that there is more subspecific differentiation than we now consider to be the case.

The gorge has been a highway whereby a few mammals have breached the barrier of the Cascades. Two Californian forms have moved east through it, the western gray squirrel and the California ground squirrel, and then spread north and south in the yellow pine forest. The mountain vole, muskrat, and whitetail deer have moved west into western Washington and Oregon. There is a marked gradient of climate, soil type, and vegetation through the gorge, and apparently few mammals can adjust to the radically different ecological conditions at the opposite ends.

In short, we can raise far more questions than we can answer, and we face the situation where we need to know much more about the taxonomy and dis-

tribution of the species that reach or approach the river, about their rates of evolution, about their dispersive abilities, about the geological history of the region, about the effects of glaciation on climate and vegetation, and about the prior patterns of distribution that were affected by these changes.

No river system in North America offers better opportunities for the study of the barrier influence of a river than the Snake River from its source in Yellowstone Park to its confluence with the Columbia River and that stream from this point to the ocean.

#### *Literature Cited*

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