DISSERTATION

ECOHYDROLOGY OF SUBALPINE WETLANDS IN THE KAWUNEECHE VALLEY, ROCKY MOUNTAIN NATIONAL PARK, COLORADO

Submitted by

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ABSTRACT

ECOHYDROLOGY OF SUBALPINE WETLANDS IN THE KAWUNEECHE VALLEY, ROCKY MOUNTAIN NATIONAL PARK, COLORADO

Wetlands in the central Rocky Mountains depend on surface water or groundwater inflows, so they are vulnerable to hydrologic modifications such as water diversions. However, a paucity of hydrologic studies limits the ability of resource managers to assess the impacts of diversions on central Rocky Mountain wetlands. This study addressed three issues regarding the effect of an existing diversion on subalpine wetlands in the Kawuneeche Valley in Rocky Mountain National Park. The concerns were: 1) reduced flow in the Colorado River is lowering the water table in riparian wetlands, 2) lowering of the water table is reducing willow seedling establishment by limiting soil water availability, and 3) the diversion of tributary streams is reducing water levels in alluvial fan toeslope wetlands.

Linear regression analyses indicated that the effect of Colorado River stage on water table levels decreased with distance from the river. The effect of the Colorado River was greatly reduced in narrow valley sections and areas near beaver ponds and oxbows. A numerical groundwater model indicated that the diversion was lowering the water table by 0.01 to 0.12 m, with the greatest reductions in areas near the Colorado River in mid-July.

A split-split plot experiment indicated that decreases in mean soil water content due to lowering of the riparian water table ranged from <4% in higher-elevation sand plots to about 15% in lower-elevation gravel plots. Although willow seedling survival was positively correlated with soil water availability, these declines in soil water content

had little effect on seedling survival. However, the reductions in high flows due to the diversion may be reducing the area of bare sediment needed for establishment.

A detailed hydrologic study of the Lost Creek alluvial fan toeslope wetland indicated that flow in Lost Creek and seepage at the toe of the fan provided more than 90% of the early summer wetland inflows. Seepage from Lost Creek sustained water levels in the alluvial fan aquifer, and this aquifer sustained groundwater flow into the wetland. The close connection between streamflows and groundwater in alluvial fan toeslope wetlands indicates that diversions can adversely affect wetlands that are not immediately adjacent to the stream.

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