

Recovery of Streamside Woody Vegetation after Exclusion of Livestock Grazing

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Abstract

Removal of livestock grazing along a small, perennial desert stream allowed the reestablishment of woody vegetation (*Salix amygdaloides*) in the riparian zone within 10 years.

Small spring/streams are widely distributed in the semiarid, sagebrush-steppe region of the northwestern United States. They are characteristically bordered by narrow corridors of deciduous trees especially cottonwoods (*Populus* spp.) and/or willows (*Salix* spp.). The value of these wooded habitats of limited extent to bird populations is well recognized and has been especially well documented on the Arid Lands Ecology (ALE) reserve in south-central Washington (Rotenberry et al. 1979). Historically, spring streams have also been the focal points of human habitation and the congregation areas for herds of domestic livestock that pasture in the surrounding sagebrush-steppe and trek back and forth to the few widely separated spring streams that serve as watering points. The physiological requirement for drinking water has tended to concentrate livestock at a few places, causing damage and even destruction of riparian woody vegetation (Thomas et al. 1979). Our paper reports on the self-recovery of woody vegetation along a small spring/stream in south central Washington after exclusion of livestock by fencing.

Location and Historical Land Use

Rattlesnake Springs is a small permanent spring/stream located on the Department of Energy's Hanford Site in south central Washington. It is isolated from the nearest major water body, the Columbia River, by more than 20 km of mostly undeveloped land. The spring/stream originates in the bottom of a narrow, deep, steep walled arroyo as a series of seeps. It flows out of the arroyo onto a wide plain before soaking into the ground about 2 km downstream from the seeps. The neo-European history of Rattlesnake Springs is not well documented but the water flow at one time was delivered from the lower reaches of the spring stream to a small cultivated field about 6 km downstream via a series of pipes and ditches. The most probable time for this was during the period 1900 to 1940. The land around the spring-stream during this period was intensively grazed by domestic cattle, sheep, and horses and the spring-stream served as a water source and as a major congregating place for livestock attracted from a wide area.

Livestock had an adverse impact on the woody plants. Shoots within reach of livestock were persistently browsed. Some mature trees along the stream were also probably cut by homesteaders for firewood, a scarce commodity in the treeless sagebrush/steppe. In 1943, the spring/stream and the surrounding land was incorporated into the Hanford Site. The resident human population was evicted and livestock grazing was discouraged. However, a few stray cattle and horses continued to water at Rattlesnake Springs from time to time until 1962 when an 800-acre fenced enclosure was

built around the entire spring-stream. Since 1963 there have been no intrusions by livestock.

In the absence of livestock the woody plants have increased in stature and density and now form a more or less continuous tree corridor along the entire length of the stream, particularly in the canyon section and immediately downstream from it.

Vegetal Recovery

An aerial photograph of Rattlesnake Springs area taken in 1963 (Fig. 1) shows the riparian tree/shrub corridor as very sparse and discontinuous. Ground surveys at the time showed only a few widely spaced broken topped (wind damaged), peach leaf willow trees (*Salix amygdaloides*). Tree willows now form a more or less continuous narrow corridor along the length of the spring-stream (Fig. 2). The vigorous recovery of tree growth along the spring-stream is attributed to the exclusion of livestock and the absence of a resident human population. In lieu of domestic livestock the woody plant community is presently utilized by a few head of wild mule deer (*Odocoileus hemionus*), and elk (*Cervus canadensis*) (Rickard et al. 1978).

Ecological Significance of Woody Vegetation to Aquatic Biota

Trees can be important environmental features to small, spring streams because overhanging tree canopies provide shade during the hot summer months and help to keep water temperatures more stable, a feature that is believed to be beneficial to aquatic organisms (Behnke 1979). Tree leaves are relatively rich in biologically essential mineral nutrients especially nitrogen and phosphorus and they also serve as a carbon source for populations of small detritivorous aquatic organisms as they fall into the stream during the yearly autumnal leaf fall event (Cushing et al. 1975).

Although shade and mineral nutrients are some of the positive attributes of tree communities, a negative aspect might be that trees can act as phreatophytes and if present in sufficient numbers, they might transpire enough water in summer to cause a reduction of stream flow by root tapping the subterranean aquifer. Reduction in flow could be deleterious to at least some stream organisms and the fauna would be changed dramatically if stream flow became intermittent rather than permanent.

Mitigation

It is clear that riparian tree/shrub communities in an otherwise treeless area play important roles in determining the abundance and species composition of fauna. The total demise of woody plants can be regarded as biologically detrimental; however, revegetation is not especially costly. Seed bed preparation, seeding, or fertilizer applications are not required. In our case removal of cattle as a stress was sufficient to allow the development of tree shrub communities.

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Fig. 1. Aerial view of the spring stream at Rattlesnake Springs, 1963. Note the virtual absence of woody vegetation.



Fig. 2. Aerial view of the spring stream at Rattlesnake Springs, 1980. Note the border of tree willows along the stream.

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