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Review and Comparison

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Article Review: A long-term infiltrometer study in southern Idaho, USA.
G.F. Gifford. 1982. Journal of Hydrology 58:367-374.

Dr. Gifford is Chairman of the Watershed Science Unit, College of Natural Resources, Utah State University, Logan, Utah 84322. He has conducted infiltration investigations into a big sagebrush *(Artemesia tridentata)* site in southern Idaho over a 12-year period. The site was plowed and seeded in the fall of 1968.

Plowing apparently caused an initial significant decline in infiltration rates. Grazing, which began in 1970, did not further reduce infiltration but seasonal trends were eliminated and there was no recovery of infiltration. Exclosures which were built on-site indicate that, in this instance, it would take at least six years for complete recovery of infiltration rates, assuming no grazing.

Dr. Gifford's report is interesting and informative and should be helpful in predicting hydrologic response to certain rangeland use practices.

It is particularly interesting to me to compare Gifford's results to those which several of my graduate students and I have found in the sagebrush country of eastern Oregon.

Among other things, we have attempted to determine hydrologic potential as based upon the subspecies of *Artemesia tridentata.* We have found that differences do exist, but that they are variable with site and location. A tendency toward increased hydrologic hazard (lower infiltration rates and increased potential sediment production) exists on the *A.t. wyomingensis* sites with a slight reduction of hazard in the *A.t. tridentata* and *A.t. vaseyana* sites. Our conclusion is that subspecies identification is not adequate, by itself, to identify hydrologic hazard; other factors including soil structure (particularly platyness and vesicular porosity), organic matter, and existing vegetation must be considered if one wishes to make predictions.

We, like Gifford, have noted an initial decline in infiltration rates following land treatment. Seemingly, this decline is brought about primarily through an increase in bare ground and a destruction of soil structure. When this occurs, rain drop splash rearranges small soil particles and often forms a soil crust which "seals" the soil surface making it less permeable to infiltration. This may be compounded by soil compaction caused by the treatment itself, particularly if heavy equipment was involved.

Interestingly, we have frequently observed a decline in potential sediment production from the same sites which are experiencing a decline in infiltration. This apparent anomaly can be explained by an increase in vegetation which frequently accompanies the disturbance. We believe that the success of the "catch" of seeded or released vegetation will determine the sediment load from the site. Thus, a good "catch" will experience less erosion than will the same site with a poorer vegetation establishment—even though infiltration rates may be the same in both cases.

We, like Gifford, are also finding that time is critical. While we have no data which would compare to his six-year recovery period, we are aware of the effects of time. It is our impression that time can either work for your or against you. It seems that two factors are at play here: soil and vegetation.

The soil factors deal with wetting/drying, freeze/thaw, root penetration, and biotic activity in order to bring about infiltration rate recovery—and these things take various lengths of time depending primarily on climate. In addition, vegetation response is time determinant. If a stand thickens with time, it will be a hydrologic plus, if it thins—for whatever reason—it is a hydrologic debit.

It is apparent from Dr. Gifford's Idaho study and from our work in the sagebrush region of Oregon that a number of complex factors are at play when one attempts to quantify the hydrologic characteristics of the landscape. Equally as apparent is the significant role that human beings and our management practices have on these parameters.

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Editor's Note: Occasionally, I think reviews of articles appearing in other magazines and journals are appropriate in *Rangelands.* They add spice and variety and sometimes bring about thought and action which is good. Hope you enjoy this one.