EDITOR'S CHOICE FROM RANGELAND ECOLOGY AND MANAGEMENT

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## Using the Rosgen Stream Classification System to Aid in Riparian Complex Ecological Site Descriptions Development

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Water is fundamental for life on Earth. Water is essential simply because it's a liquid at temperatures common on Earth. Because it flows, water provides an efficient way to transfer substances at all scales, from a cell's environment into cells, to facilitating migration of fish and vegetation across landscapes. Understanding that the origin of water is from the beginning processes of creating the Universe helps show how it became so fundamental to life on Earth. Hydrogen is the basic building material of the Universe, created in the Big Bang. Oxygen is created by nuclear reactions in stars. If you put hydrogen and oxygen together in the cold of space, you get water. There are enormous amounts of water in space. Over millions of years during the formation of the Earth, it is thought that water was delivered to Earth by the asteroids, comets, and material that collided with the Earth as gravity attracted them. Water exists in all layers of the Earth and comprises about 0.04% of the Earth's mass. It provides the transfer medium for nearly all biological functions.

In arid rangeland, a properly functioning hydrologic cycle is essential to sustaining plant and animal life and water is often the most limiting resource. Water is a critical part of nearly every process that occurs in rangeland ecosystems. Water has been a major selective force for plant and animal evolution, probably second only to the sun. More than any other ecosystem, the structure and processes of riparian systems are determined by their interaction with adjacent rangeland ecosystems. The long and thin networks of streams and river tributaries dissect dry landscapes, and magnify the relationship between riparian areas and their neighboring uplands. The meandering streams and rivers connect mountaintop headwaters with valley floors. Waterways are the route for transferring nutrients, sediments, organic matter, fish, and plants, and provide an essential corridor for animal movement up-and downstream.

Riparian zones are one of the most susceptible systems to disturbance, but often the most resilient as well. The vegetation along riparian corridors is uniquely different from that of uplands because they have evolved to help protect the soil and running water. Riparian vegetation helps to maintain and improve water quality by functioning as a buffer, filtering out sediments and debris. It provides habitat for organisms that contribute to the water's health, and it creates an obstacle that slows down stream flow, especially after a rain event. The meandering flow of a stream, combined with vegetation and root systems, slow the flow of water, which reduces soil erosion and flood damage. Sediment is captured, thus filtering suspended solids, reducing turbidity, replenishing soils, and building stream banks. At the same time, pollutants are filtered away with surface runoff, which improves water quality. Riparian vegetation can also provide forage for wildlife and livestock.

It's true that the development and characteristics of most societies are directly reflected in how they conserve and manage their natural resources. Mahatma Gandhi suggested, The greatness of a nation and its moral progress can be judged by the way its animals are treated. In the same vein, Aldo Leopold's son Luna said, Water is the most critical resource issue of our lifetime and our children's lifetime, and the health of our waters is the principle measure of how we live on the land. I am guessing that Luna would agree that the prosperity and persistence of a nation could be calculated by the clarity of their water.

With all of this in mind, the manuscript entitled, Using the Rosgen Stream Classification System to Aid in Riparian Complex Ecological Site Descriptions Development by Miranda A. Meehan and Peter L. O'Brien has been selected for the Editor's Choice Award for Rangeland Ecology and Management Volume 72, Issue 5. These researchers set out to add to the ability of land managers to uniformly classify and discuss the ecological status of streams and rivers on rangeland by integrating the currently used stream classification system (Rosgen Stream Classification System) with the Riparian Complex Ecological Site Descriptions Development (ESD). The difficulty lies in the fact that ESDs for uplands are based on soils, vegetation, and

topography, whereas riparian areas are primarily driven by hydrology that is not necessarily captured in the three primary characteristics.

Their study categorized riparian areas by hydrology using stream geomorphology and the Rosgen Stream Classification System. Stream cross-section and longitudinal profile data was collected from seventy-five reaches from nineteen streams in North Dakota, USA, from 2012-2018. Each reach (i.e., one full meander) was classified by channel type (E, C, B, F, and G), and stability class (stable and unstable). A stream parameter matrix was constructed using entrenchment ratio (ER), width-to-depth ratio, sinuosity, slope, channel bed material, bank height ratio (BHR), and meander width ratio (MWR). A multiple response permutation procedure showed that the parameters differed based on both channel type and stability class. An indicator analysis showed that entrenchment ratio, bank height ratio, and meander width ratio were the parameters most influential in separating the reaches by stability class. The strongest indicator for stable reaches was ER, but MWR and BHR were also significant indicators of stable and unstable reaches, respectively. The parameters used in this study to delineate channel type can be used to consistently discriminate between stable and unstable channels. This information may be a useful tool in describing the states and transitions of prairie stream development in riparian complex ESDs, validating the continued use of Rosgen Stream Classification System in ESD development.

Some of this paper was lifted directly from their manuscript, which you can find in Rangeland Ecology & Management, 72 (5):729-735. Please take a few minutes to look over their manuscript.

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