Assessment of Measurement of Livestock Impact on Riparian Sites: Part 1

Oregon Cattleman's Association

Progress Report: Prepared by Larry Larson PhD.

Introduction

A project proposal (2019) was submitted and funded by the Public Lands Council to develop a science-based methodology to examine the accuracy and repeatability of MIM (Multiple Indicator Monitoring) and stubble height measurements in riparian areas.

Science-Based Methodology

Work associated with the validation of the component parts of the science-based methodology was published in 2019 and 2020.

Larson, L., P. Larson and D.E. Johnson. 2019. Differences in stubble height estimates from systematic and random sample designs. Rangeland Ecology and Management. 72: 586-589.

Larson, L. and P. Larson. 2020. Animal track accumulation on streambanks of four Eastern Oregon streams. Rangeland Ecology and Management. 73: 224-226.

Larson, L. and P. Larson. 2020. An assessment of riparian shrub browsing. Rangelands. 41: 145-148.

Methodologies tested in the above studies demonstrated that random sampling designs are required to determine the accuracy and confidence associated with population estimates, that the timing and placement of sample plots impact (bias) track data results and interpretation and that changes in shrub populations through time could be successfully monitored using growth form data.

Data Collection

Part 1 data collection during the 2020 and 2021 field seasons, yielded data sets from 15 different riparian sites in Eastern Oregon. The sites included perennial and intermittent streams (lotic) as well as lentic valley bottoms with site potentials that ranged from wetland meadows to dry riparian meadows. The data sets captured pre- and post-grazing conditions on each site. Stubble height and track accumulation data were measured on both greenline (bankfull) and MIM protocol designated locations near the 'water's edge during summer low flow'. Shrub

population attributes were measured along the greenline. The data collection efforts yielded 130 complete data sets with 50+ random samples for each attribute measured.

Preliminary Analysis

Data collection for the 2021 field season ended in October, completion of data analysis is targeted for the end of winter. This progress report describes a preliminary analysis of that work.

An initial assessment of data accuracy and the level of confidence that could be placed on the data sets was inferred from the determination of sample adequacy. The adequacy of data sets was tested to establish the number of samples required to achieve a mean estimate that was within 10% of the actual mean value with 95% level of confidence. For most data sets, this standard was achieved with 25 or fewer samples. All of our data sets contain a minimum of 50 samples. As a point of reference, published results from the comparison of systematic to random sample designs (Larson et. al 2019) reported that the systematic sampling design typically required 5Xs the number of samples required by the random sampling design to achieve this level of confidence.

Initial testing of the track data sets has established that track accumulation at the greenline (bankfull) location did not increase during the pre-grazing to post-grazing period. This period of track accumulation would be assigned primarily to livestock entering the riparian area. During this time period track accumulation increased by about 4%. Track accumulation at the MIM protocol designated location showed a similar pattern of accumulation during the period of active livestock use. However, the Greenline location averaged 13% less total track accumulation when compared to the MIM location. In practical terms this meant that the MIM sites (either pre- or post-grazing) typically exceeded the 20% track accumulation standard. This difference between Greenline and MIM monitoring likely resulted from the pattern of substrate saturation. The load bearing ability of finer substrate material is dramatically dropped when saturation or near saturation conditions exist. The channel, where MIM protocol places the sampling unit, is a zone of annual erosion and deposition that maintains saturated conditions near the channel surface as long as water exists in the channel. As a result, MIM data sets are most susceptible to track formation that are ephemeral due to their location in the zone of annual erosion and deposition that maintains the channel.

Part 2

The objective of Part 2 of this project will be to illustrate a solutions based answer to the issues observed in the MIM protocol. This will be accomplished in 2022 through outreach in the form of short articles, workshops, field training and a synthesis document that describes the knowledge gained through this research.