Adaptive rotational grazing and the story of the regrazed grass plant

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CONTEXT

Frequent, severe defoliation reduces grass production and can alter plant species composition in grasslands. Multi-paddock rotational grazing has been proposed as a grazing strategy that may reduce the frequency and intensity of defoliation on palatable grass plants without altering stocking rates. Previous studies evaluated this hypothesis using small, homogeneous paddocks and non-adaptive rotation schedules, and found small and inconsistent differences between continuous and rotational grazing systems. Using a stakeholder-driven Collaborative Adaptive Management framework, we conducted the first ranch-scale experimental investigation into tiller defoliation patterns in the context of adaptive multi-paddock rotational grazing.

APPROACH

We monitored tiller defoliation frequency and intensity of a palatable cool-season grass, western wheatgrass (Pseudotyphurus smithii), in ten paired 130-ha paddocks which were assigned to either a collaborative adaptive multi-paddock rotational grazing treatment (CARM, one livestock herd) or a season-long continuous grazing treatment (TRM, ten separate herds) in shortgrass steppe. Both treatments had the same ranch-scale stocking rate, which was moderate for the region. To enhance the inference space of the CARM results, we also collected data in two 130-ha paddocks that were part of a long-term grazing intensity study. One paddock had been grazed at a heavy stocking rate (targeted for 60% utilization of peak growing season biomass) and the other at a light stocking rate (20% utilization) every year since 1939.

RESULTS

1) Did grazing treatment (CARM vs. TRM) affect the proportion of western wheatgrass tillers that were grazed, the average number of times a given tiller was grazed, or the average season-long change in tiller length? NO. Under moderate stocking rates used in both CARM and TRM treatments, defoliation patterns were similar between treatments at the whole-ranch scale. Roughly two-thirds of western wheatgrass tillers remained ungrazed annually, regardless of grazing system. Frequencies of tiller regrowing were low (5-15%) and similar between CARM and TRM treatments.

2) Did grazing treatment affect tiller defoliation patterns among paddocks? YES. CARM enhanced spatial and temporal heterogeneity in defoliation rates among individual paddocks.

3) Within the CARM grazing treatment using adaptive multi-paddock rotation grazing, did did paddock-scale stocking rate and timing of grazing affect tiller defoliation? Paddocks grazed earlier in the season or for longer experienced more defoliation.

4) Did the number of times a tiller was grazed affect its average, season-long change in length or regrowth capacity? YES. Grazing and regrazing reduced growth.

CONCLUSIONS

Collaborative adaptive multi-paddock rotational grazing did not lower rates of grazing and regrazing on western wheatgrass tillers at the ranch-scale in the shortgrass steppe, when compared to season-long continuous grazing at the same stocking rate.

Thus, the use of adaptive multi-paddock rotational grazing strategies should not be expected to enhance the production or abundance of this palatable, cool-season species. In fact, when viewing the world from the humble perspective of a western wheatgrass tiller, it is apparent that season-long rest is built into season-long continuous grazing as well as rotational grazing. These results challenge a major purported benefit of multipaddock rotational grazing relative to continuous grazing. In the end, like many previous studies, we conclude that stocking rate is a far more important driver of ranch-scale defoliation rates than the spatiotemporal movement of cattle among paddocks. Although defoliation patterns were similar between CARM and TRM at the whole-ranch scale, the spatial and temporal heterogeneity created by CARM (higher and predictable variability in defoliation frequency among paddocks) could be used to strategically minimize or maximize the impacts of grazing on western wheatgrass or other palatable grasses at the individual paddock scale. The Collaborative Adaptive Management model enabled our team to identify and directly address key stakeholder hypotheses, resulting in co-production of management-relevant research.

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