Soil nutrients dynamics and the evolution of multi-decadal degradation in alpine wetlands of the Qinghai-Tibetan Plateau

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Background

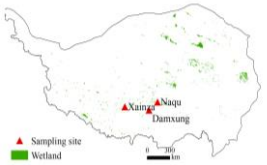
The Qinghai-Tibetan Plateau (QTP) has about 50,470 km^2 of swampy meadows (Wei et al., 2015). As highly productive and nutritious pastures, they have supported the local animal husbandry for centuries. However, in the recent decades the swampy meadows have experienced severe accelerated degradation Swampy meadow degradation can leading to substantial loss of soil nutrients and altering carbon and nutrient cycling (Tian et al., 2017). Wetland degradation process can last for many years, however, the soil nutrient in swampy meadows and their successive degradation situations are poorly known.

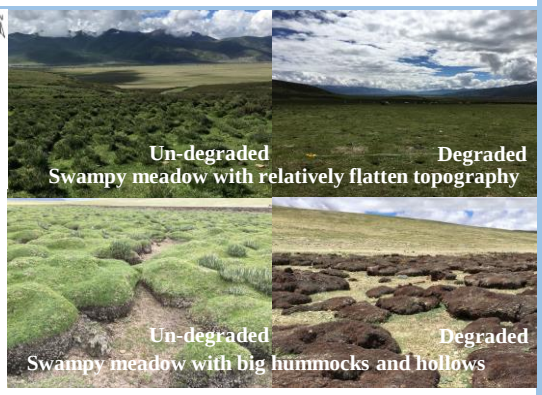
Objectives

1) delineate the timing of soil nutrients changes in the alpine swampy meadow after long-term degradation, and 2) interpret the soil nutrients changes caused by swampy meadow degradation.

Site description

We located sampling sites at Damxung, Naqu and Xainza (Tibet Autonomous Region), respectively. The swampy meadow at Damxung site has a relatively flatten topography, the hummocks were about centimeters high and mostly ten to thirty centimeters in diameter. The swampy meadows at Naqu and Xainza are comprised of hummocks that mostly more than twenty centimeters high and larger than thirty centimeters in diameter. Higher and larger than the sampled swampy meadow at Damxung. Along the degradation gradient, we located plots representing un-degraded and multi-decadal degradation for each decade.

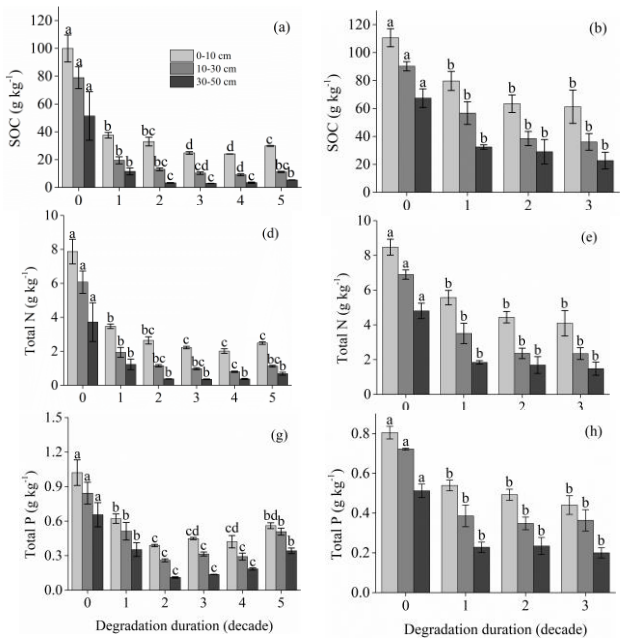




Sampling and analyses

Field work was performed during July to August 2017. Soil cores and above-ground biomass were sampled. SOC, TN and TP in the samples were measured in the laboratory by the potassium dichromate-oxidation external heating method (Zhang et al., 1999), Semi-Micro Kjeldahl method and acid soluble- method (Ruzhen Jiao et al., 2015), respectively.

Results



Swampy meadow with relatively flatten topography (a, d, g); Swampy meadow with big hummocks and hollows (b, e, h).

Conclusions

The soil nutrients loss was highly affected by the geomorphic characteristics of the wetland area. After degradation the SOC, TN, and TP contents were decreased at exponential rates on the flat terrain site. The soil nutrients decomposition rate of hummock-hollow sites was much lower than the flat terrain site. Large and tough hummocks in swampy meadow degradation sites can resist environment erosion and stabilize soil nutrients content at high levels.

Acknowledgment

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