Soil Seed Reserves

In the arid zone of Australia short-lived and ephemeral plants are abundant in the vegetation ground layer after good rainfall. In a matter of weeks after rain these plants grow and produce large amounts of seed before conditions once again become dry. After the seed is dispersed it is incorporated into the soil and becomes part of the "seed bank". When rain does fall, seeds are always available in the seed bank for germination and the cycle of growth and seed production begins again. Seed banks are vitally important in the arid zone where rainfall is low and unpredictable. They allow species to persist in the landscape during dry times when conditions are too tough for plant establishment or growth.

Does grazing affect the seed bank?

We researched the seed bank of the grazed calcareous grasslands of Central Australia. To determine the number of seeds in the seed bank, soil cores to a depth of 5 cm were taken from the study site. The soil cores were then spread over potting mix and placed in the CSIRO glasshouse. The

number of germinants of each species was then counted to indicate the size of the germinable seed bank.
On lightly grazed areas, the number of seeds in the seed bank fluctuated through out a three year period but the seed bank persisted. In areas that had been grazed heavily for a long time, the number of seeds in the seed bank was low by comparison. Vegetation surveys revealed that grazing had also caused permanent changes to the vegetation. This evidence led us to conclude that under long-term heavy grazing a persistent seed bank could not be maintained.

What are the processes at work?

The research also investigated the possible reasons for the reduction in seed bank numbers at the more intensely grazed areas. A decline in soil stability was found at all grazed sites but especially at the heavily grazed sites. A low level of soil stability leads to greater soil loss through wind and water erosion. Seed is lost along with the soil when erosion occurs. We detected a reduction in seed density after a heavy summer rain led to soil erosion. We also found that the amount of soil caught in traps was highest where grazing was heaviest.

Permanent barriers like perennial shrubs and fallen tree logs play an important role in these grasslands. They trap seed, nutrients and water, the essential resources for plant germination and growth. At the more heavily grazed sites the number of perennial shrubs had declined as a result of the constant trampling of cattle. This decline results in seed and other vital resources moving long distances during erosion events before being trapped. In these situations the resources for plant growth are not maintained within a local area and, in extreme erosion events, can be lost all together.

Conclusions

Changes in soil seed banks are a consequence of the impact of heavy grazing on landscape processes and vegetation.

Further reading

Kinloch, J.E. and Friedel M.H. (1996). Seed banks and soil loss in grazed arid grasslands – some preliminary results. In: 9th Biennial Australian Rangelands Society Conference, Port Augusta (Eds L.P. Hunt and R. Sinclair) pp. 243-4. Australian Rangeland Society, Perth.