

Introduction and Overview

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The world's temperate grasslands are of two types. Type 1, mainly in Eurasia, the Great Plains of North America and the veldt of South Africa, had large, hooved, congregating grazing mammals which caused the evolution of grasses tolerant to heavy grazing. In type 2 grasslands, mainly in South America, California, the North American Intermontane West and South-eastern Australia, such mammals were rare or absent. In this type, many species were virtually or entirely eliminated by stock grazing and trampling and their places taken by alien species. Conserving what we can of the tiny fragments remaining is the task that confronts us today.

In a recent paper, the American ecologist Richard Mack has divided the world's temperate grasslands into two types. Type 1 is exemplified by the grasslands of Eurasia, the Great Plains of North America and the South African veldt. In these areas, the main grazers were large, hooved, congregating grazing mammals. These were plentiful and they caused the evolution of grasses tolerant to heavy grazing — including both tussock and rhizomatous or turf grasses. The rhizomatous types which evolved were also tolerant to trampling damage from the hooves of heavy mammals, being readily able to propagate vegetatively. The type 1 grasslands have proved to be generally resistant to invasion by alien plants and to stock grazing, but not, of course, to ploughing.

In all other temperate grasslands, large hooved congregating grazing mammals were rare or absent and the grasslands became dominated by tussock grasses intolerant to heavy grazing. With the arrival of Europeans, their grazing animals and grazing tolerant plants, these type 2 grasslands were irreparably transformed by what's been called one of the great historical convulsions of the earth's biota.

Here is the sequence of events in the four areas involved:

1. The South American Pampas. These are the grasslands of Argentina and Uruguay. In this area bovids (cattle and their relatives) and sheep were completely absent. By 1770, the transformation of the pampas was already underway. By 1872, Charles Darwin wrote that Artichoke Thistle and Variegated Thistle 'are now the commonest (plants) over the whole plains of La Plata, clothing square leagues of surface almost to the exclusion of every other plant' (quoted in Mack, 1989).
2. The Central Valley of California. In this area bison and other bovids were scarce to absent. The valley was already being transformed by Spanish settlement in 1800. By 1833, there are already reports like 'a large prairie covered in wild oats' — wild oats being the European introduction of course. Recently Mack writes: 'the vegetation ... has long borne no resemblance to the pre-settlement plant communities.'
3. The Intermontane West of North America. This is the area between the Rocky Mountains to the east and the Sierra Nevada Ranges to the west. Strangely, bison were present only as small isolated herds. Intensive settlement beginning in 1870 overwhelmed the native grasslands. Mack writes: 'The outlook is only for more change in the vegetation as new immigrants displace the old through the same agencies that fostered earlier invasions: disturbance and transport.'
4. The Grasslands of South-eastern Australia. Here the largest grazing animals were non-hooved kangaroos weighing less than 100 kilograms. The dominant native grasses here were all tussock grasses, as was the case in the other three areas — none of the dominant grasses was rhizomatous. Transformation of these native grasslands began in about the 1830's. As in the other three type 2 areas, the tussock grasses generally displayed little tolerance to grazing or trampling and were quickly eliminated.

In summary, all four type 2 grasslands were colonized by Europeans between about 1770 and 1880. With this similar history comes a striking similarity in the alien plants that became dominant. *Avena*, *Hordeum*, annual brome grasses, *Erodium* and thistles like *Cirsium*,

Cynara, and *Silybum* all became prominent in all four areas. What a depressingly familiar list to us all today. All the prominent aliens share a tolerance for the continual disturbance found in agricultural systems - this is something missing amongst almost all the native plants present. Of course most of the invading plant species originated in the grasslands of Eurasia, so their success as aggressive invaders was due to their long adaptation to agricultural disturbance in their homeland. As Richard Mack (1989) points out, it is the irony of temperate grasslands that some have produced many of the most aggressive plant invaders, whilst others are among the most susceptible communities to invasions.

Turning more specifically to the issues to be addressed by today's conference, I'm sure that many of us share some common experiences. We've come to see what tiny, fragile refuges the original grassland communities have become reduced to. Having come to appreciate and treasure these, we've then certainly had to endure the pain of seeing a big proportion of them destroyed before our eyes.

If we had to make a list of the agents of destruction we would have to include:

1. herbicide spraying and ploughing said to be for fuel reduction,
2. failure of government departments to apply appropriate burning regimes so that Kangaroo Grass chokes out most of the associated species,
3. destruction of unique, naturally treeless remnants by community tree planting schemes, and
4. ploughing of priceless remnants on public roadsides by well-heeled private land-holders to grow clover hay to sell for profit, an activity which we could well call money-grubbing.

The situation reminds me of a recent paper by the eminent Adelaide ecologist Bob Lange (1985), where he recalls as a school child at an Arbor Day over 40 years ago, first hearing about landcare from his headmaster. He goes on, and I quote:

'What is the point of this recitation? The point is that there were educated people in positions of authority, on that Arbor Day long ago, who knew very well what the emerging problems were and, within broad limits, what steps to take to arrest them. But that knowledge and authority was not applied. Now all the King's horses and all the King's men could not restore the lake, replace the scrubs and bring back the land values that seem so casually to have been squandered during my lifetime. Are we trying hard enough to do better?'

References

- Lange, B. (1985) 'Revegetation' in Australia. In Venning, J.(ed.) *Revegetation Workshop Held in Adelaide, 27–29 March 1985*, Department of Environment and Planning, Adelaide, 9–12.
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