

The project was initiated to counter the degrading effects on natural systems of altered fire regimes. Before the project, the Kimberley's fire patterns were dominated by frequent extensive wildfires in the mid-to-late dry season which contributed to observed biodiversity losses, degradation of ecological processes and cultural values, and reduced pastoral production.

EcoFire aims to restore biodiversity, pastoral and cultural values by reducing the incidence of these fires in the central and north Kimberley. It achieves this through strategic coordinated regional fire management across the 14 properties (5 million ha). Each year, the effectiveness of EcoFire in decreasing the size of unplanned fires and increasing the patchwork of burnt and unburnt areas across the region is examined. Fire patterns are compared against fire targets to measure whether the goal of less intense and patchier fires is being achieved.

To date, EcoFire's prescribed burn programme has resulted in a substantial change to regional fire patterns. After just 1 year, improvements were achieved in all fire targets including shifting more fires into the early rather than the mid-to-late dry season (i.e. 41% of all fires occurred early in the dry season during 2007, compared with 27% in the previous three years), and decreasing the average size of mid-late dry season fires. This was accomplished by an aerial prescribed burning programme, excellent on-ground knowledge of conditions and fire histories, and full participation by landowners and managers in the project areas.

The success of the project has relied on having a coordinated and strategic approach to fire management; clear measurable outcomes; successful engagement by participants with diverse interests and backgrounds (including frequent and personal communication and encouragement of ownership); productive partnerships with state and local government agencies; employment of a project leader who is a member of the community; and the flexibility to allow participants with various backgrounds (pastoralist, indigenous, conservation managers) to approach fire management differently.

EcoFire is funded by the Natural Heritage Trust via the Rangelands Natural Resource Management Coordinating Group, who contracted the Australian Wildlife Conservancy (AWC) to undertake the project. Given the widespread concern about changed fire regimes and biodiversity, the popularity of the project in the region, and the potential for capitalizing on greenhouse gas emission reductions, AWC anticipates sourcing funding to continue this project indefinitely.

Contact:

sarah@australianwildlife.org; www.australianwildlife.org

WEEDS & FERAL ANIMAL ISSUES &

Table 1. Number and location of Gamba Grass seeds that attached to different areas of the assistants), after 3 h of field work in a savanna heavily invaded by Gamba Grass

Location on body		Number o.		
		Subject 1	Subject 2	
Head	Hat	2		
	Hair	4	1	
Upper body (shirt)	Exterior		9†	
	Pockets	8		
	Other (brassiere)			
Lower body (jeans)	Exterior			
	Pockets	6		
Feet	Shoes	6	26	3
	Socks			
	Backpack	39		–
Total		65	36	11

Data refer to the number of seeds on upper body overall; subject did not distinguish between seeds found on exterior and in p. the number of seeds in all pockets (upper and lower body); subject did not distinguish between seeds found in shirt and trouser

a considerable difference in the number of seeds recorded on each subject. Subject 1 recorded the highest number of seeds (65), with the remaining subjects recording 36, 11 and 8 seeds. Over half (39 seeds, 60%) of the seeds recorded on Subject 1 were found on the backpack, whereas the head, upper body, lower body and feet areas each contained 6 or 8 seeds (Table 1). Most seeds recorded on the backpack had fallen into the outside water bottle compartments, although a few were located inside the main compartment. Seeds on the other subjects were also typically found in pockets (jeans and shirt) and in the crevices of shoes and socks, rather than on the exterior of clothes (Table 1). The backpacks carried by subjects 2 and 4, which did not possess external water bottle holders, did not trap seeds like subject 1.

Discussion

These observations demonstrate the potential for Gamba Grass seeds to be dispersed by people, on their clothing and personal equipment (such as backpacks). Gamba Grass seeds are not sticky and do not have sharp barbs, so they rarely attached to the exterior of clothing (i.e. shirts and trousers), but instead fell into crevices such as pockets and shoes. The high number of seeds in pockets (and external backpack pockets) probably relates to their use for storing equipment such as GPS units. Seeds were found to enter pockets on subjects' hands when equipment was being replaced. The difference in the number of seeds between subjects (8–65) was in part due to the design of the backpacks they carried, with open external compartments trapping many seeds.

Seed attachment on clothing and personal equipment, as described here, has important implications for the management of Gamba Grass in northern Australia, as well as other grassy weeds with similar seed dispersal mechanisms (e.g. Mission Grass, *Pennisetum pedicellatum*

Trin. and *Pennisetum polystachion*(L.) Schult., Grass, *Themeda quadrivalvis*(L.) Kuntze). While naturally dispersed by wind and water (and these seed dispersal continue to be very important, dispersed seeds could be responsible for the establishment of some major, isolated populations. People who weed-infested areas (in northern Australia these hunters, graziers, bushwalkers, land managers, trail riders, hobby farmers, etc.) should realize that they are likely to be unintentionally carrying seeds, which can easily be deposited in native vegetation by brushing against plants, or by taking equipment in and out of pockets. In addition, seeds may be transported much further apace (i.e. to a person's house) given the possibility for seeds to remain in pockets for extended periods. For Gamba Grass seeds are known to remain viable for 3–6 years in laboratory conditions (Bowden 1964).

Strategies for reducing the unintentional dispersal of Gamba Grass seeds should include performing a full body check for seeds after working in invaded areas, as is recommended for Siam Weed (*Chromolaena odorata* (L.) R.M. King & H. Rob.; Biosecurity Queensland 2007). In reality, the time and effort required (10 min) probably prevents this precaution from being rigorously observed. As an alternative, albeit inferior, wearing shirts and trousers without pockets, ensuring that socks are fully covered (e.g. by boots), and carrying backpacks without exterior seed traps, could minimize seed attachment. Although not feasible for all situations, work could be restricted to periods after seed fall (late dry season and wet season), or after sites have been burnt, to minimize body contact with seeds. In conclusion, people who visit areas with weeds present should ensure that they do not carry and disperse seeds on their clothing and personal equipment, in addition to on their vehicles as is usually advised.

