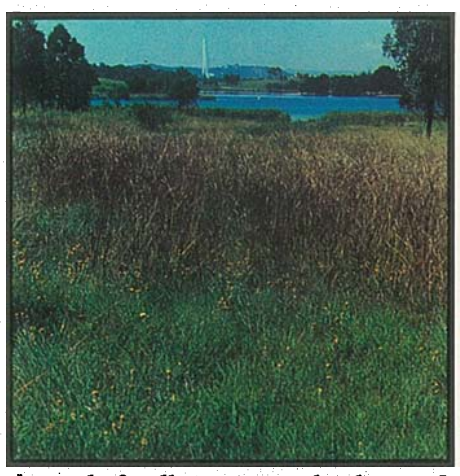
Growing native grasses in urban parks



A stand of redleg grass on the shores of Lake Burley Griffin, A.C.T.

A patch of spear grass growing in a Canberra suburb.

After almost two centuries of European settlement, the native grasses that colour the Australian bush with their reds, purples, browns, silver-greys, and greens are being considered as alternatives to introduced species in new areas of urban parkland.

They need little water and no fertilizer and are accustomed to bushfires. In contrast, introduced species such as ryegrasses and clover need large applications of water and fertilizer each year to keep them green and healthy.

Over long periods of time, native grasses have become adapted to variable and often low rainfall, and use the available soil moisture at a much slower rate than introduced species do. They generally grow best on infertile soils. In fact, fertilizer applications can often lead to the rapid disappearance of some species.

Until recently, parkland management authorities had never seriously considered native grasses as alternatives to species like perennial ryegrass, tall fescue, and Kentucky blue grass—which are often prohibitively expensive to maintain at European standards. But now a number of authorities, including the Department of the Capital Territory and the Victorian National Parks Service, are considering or are already using native grasses for revegetation.

One of the first bodies to realize their possible value was Canberra's National Capital Development Commission (NCDC), which thought the grasses might suit low-use parkland areas in the new suburbs, roadside reservations, and verges. The problem was that nobody knew very much about the life habits of these native species. They had no information on such matters as how to harvest the seed, when to plant, the periods of seed dormancy, and germination. Nor did anybody know how to manage the sward once it was established.

Measuring trial plots of kangaroo grass.

Wallaby grass in flower.

So 3 years ago the NCDC approached the CSIRO Division of Plant Industry's Ecology Section for advice, and offered to fund a research project on native grasses. The project was to be undertaken in conjunction with the research unit of Canberra's City Parks Administration. And in 1973 a group of researchers led by Dr Richard Groves, and including Mr Mike Hagon, Mr Charlie Chan, and Mr Colin Totterdell, began a survey of a large valley to the south of Canberra—now the site of Canberra's new town. Tuggeranong.

Four grasses

Their first problem was to discover which native species predominated in the natural situation, as many had almost disappeared due to continuous sheep-grazing. They began by taking aerial photographs of the long triangular region stretching southwards from the ACT–New South Wales border, running between the Murrumbidgee River in the west and the Queanbeyan–Cooma railway line in the east. From these they drew up a photomosaic that showed areas still under native grasses. They then surveyed these areas, both from the air and on the ground, and classified them according to their vegetation.

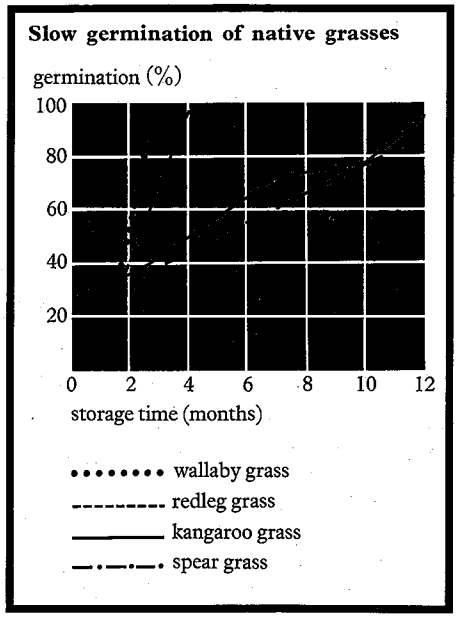
Four species were found to be dominant—kangaroo grass (*Themeda australis*), redleg grass (*Bothriochloa macra*), short wallaby grass (*Danthonia* spp.), and tall spear grass (*Stipa bigeniculata*).

Redleg and kangaroo grasses, both warm-season perennials, mature in April and January respectively. Kangaroo grass has green to blue-green foliage during spring, slowly changing to purple and later to brown during autumn and winter. Redleg is tinged with red and purple and

changes to a straw colour in winter. Wallaby and spear grasses are both cool-season grasses and remain green during the winter. So the four grasses can readily enhance the landscape with their changing colours and textures.

The next stage was to study the structure, germination, field establishment, and management of these four species. The team found that freshly harvested seed of all four contained germination-inhibitors in either the husks or the seed, or in both. It took 3–4 months' storage at room temperature for redleg and wallaby grasses to lose their dormancy, and up to 11 months for kangaroo and spear grasses to do so.

However, they found that storage of kangaroo grass and spear grass seed in an uncontrolled glasshouse at maximum temperatures of 40°C reduced this period to only a month. Seed viability of all the species after dormancy was very good, ranging from 60% for spear grass to the high rate of 98% for wallaby grass.



Freshly harvested seeds of native grasses will not germinate very well. But seeds of wallaby and redleg grasses will germinate readily after storage for 3–4 months. Those of kangaroo grass and spear grass take much longer to lose their dormancy—up to 11 months.

Getting them started

Investigations of the factors affecting germination showed that temperature and water were the two most important. Field and laboratory tests demonstrated that the two warm-season grasses, kangaroo and redleg, would not germinate until the daily maximum temperature reached about 25°C or the average temperature was at least 18°C. Seed had to be sown between October and March in the Canberra area (the best sowing time was November). However, high temperatures lowered the emergence rate.

The cool-season wallaby grass and spear grass were less affected by temperature, provided the maximum was less than 35°C and the minimum greater than 0°C. Wallaby grass germinated best in March and April in the Canberra area. Spear grass proved less sensitive to temperature than the other species—provided the average exceeded about 10°C—and germinated best in March, October, and November.

Lack of moisture affected germination of all four species. In fact the research group found that ryegrass had a greater ability to germinate under moisture stress than the native species. Spear grass was the least affected and kangaroo grass the most. The team concluded that the seed of all four should be slightly buried, in order to get the greatest seed–soil contact and the most benefit from soil moisture.

They also carried out small field trials to discover the effects of seeding and fertilizer rates and mulching. They found fertilizers had very little effect. Applications of 150 kg of an NPK fertilizer per ha had a very minor effect on establishment, but mulching with paper, or especially straw, significantly improved it.

Although mulching didn't affect soil temperature much, it did improve the level of soil moisture. A mulch of straw or paper, at the rate of 3200 kg per ha, improved the establishment of all four species. Bitumin applied at the rate of 12 000 litres per ha had a beneficial effect on wallaby and kangaroo grasses, but markedly reduced the establishment of the other two. After 6 months, survival rates differed little between plants that had been mulched and those that had not.

A major problem of establishment was competition from weeds, particularly with the cool-season grasses, and to a lesser extent with kangaroo and redleg grasses. The researchers found that pre-emergence treatment of weeds was needed if wallaby grass or spear grass were to be established in a weedy situation.

They investigated the use of various herbicides and found that DCPA at 6 or 12 kg per ha reduced the number of emerged seedlings of wallaby grass and spear grass. It had no effect on the other two. Diuron at 4 or 16 kg per ha was toxic to seedlings of all four. However, applications of activated carbon—as a band or pelleted on the seed—overcame the toxic effects of both herbicides, at least at the lower rates of application.

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The team also investigated seeding rates, using the phytotron in Canberra as well as small-scale field trials. They found that, when sown separately, the best seeding rates were up to 100 kg per ha for spear grass, and 25–50 kg per ha for the other three.

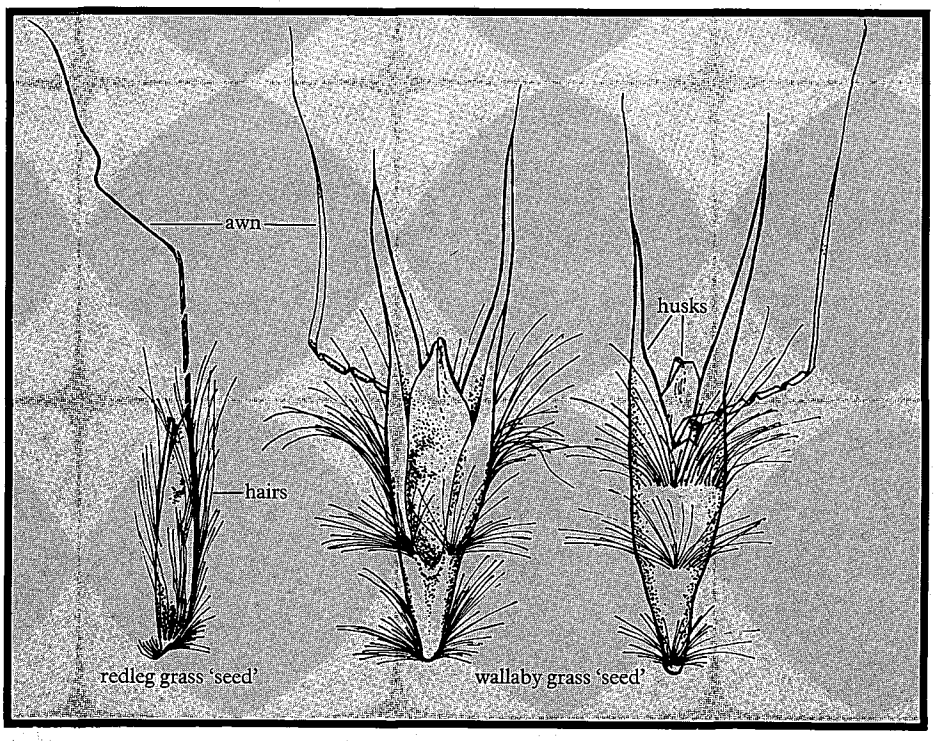
They looked at optimum mixtures of kangaroo grass and wallaby grass—warm- and cool-season species respectively, giving all-year-round grass colour. They found that to produce the best vegetative growth a sward should have a greater proportion of wallaby grass plants in it. (This prevents the kangaroo grass eventually dominating the sward.) Moreover, the maximum number of flowering stems of each species resulted from a ratio of about one kangaroo grass plant to two of wallaby grass.

Keeping them going

Research into management of established grasses has just been completed. The results show that, where kangaroo grass dominates, the sward needs no fertilizer and should not be grazed heavily or continuously, especially by sheep. Firing should be done every 2–3 years in late winter; it should not be done every year. If this is impracticable, the area needs to be mown annually to a height of 7–10 cm and the litter mulched and left. Mowing every 3 months has no short-term detrimental effect on the grassland, but much more frequent mowing may reduce plant vigour.

A trial by the Department of the Capital Territory found that where redleg was the dominant species the grassland could be satisfactorily maintained by infrequent mowing (to a height of 6 cm) without the addition of fertilizers or water. In another experiment, mowing at the same height every 3 months during the growing season increased the number of flowering stems, without reducing plant survival over 12 months.

Where wallaby and spear grasses dominate, mowing to about 5 cm can be done regularly in spring, summer, and autumn without harming the plants; the best growth of the flowering stems results'



Seed should be treated before sowing so that it runs freely through planting equipment. Awns should be removed from kangaroo grass, awns and hairs from redleg and spear grasses, and husks from wallaby grass.

when it is done as early as possible in the spring. Fertilizers and water are not needed.

One major problem that still needs solving is seed collection. It is difficult to get sufficient quantities of viable seed; not only are yields low, but the seed-head shatters easily and must be collected at exactly the right time. A daily watch is needed to avoid large losses. For example, more than 90% of spear grass seed can be lost if harvesting is delayed by a day or two after it has reached maturity.

The research group found that a trough attached to the front of a vehicle can be used to collect large quantities. Even so, natural grasslands of kangaroo and wallaby grasses can yield only 10 kg of seed per ha.

An alternative to sowing seed is vegetative propagation, which the research unit of Canberra's City Parks Administration has been working on for the last 2 years. A group led by Mr John Fryer has concentrated on kangaroo grass and has a number of experimental plots around the city.

They have found that crowns of divided plants need to be planted out in late winter or early spring to give the best result. A 60% establishment rate can be achieved with either hand or mechanical planting. They recommend that the crowns should be at least 40 cm in diameter and top growth should be cut back to a height of 7 cm to reduce the number of flower heads. Because of the high handling and planting costs, Mr Fryer sees this method as an alternative to sowing seed only in small areas, such as roadside verges.

Despite problems of seed collection, researchers from both CSIRO and the City Parks Administration believe native grasses have a role to play. For example, swards of them are being used between animal enclosures at the new Western Plains zoo at Dubbo. And the Department of the Capital Territory has planted kangaroo grass on an experimental basis on a number of roadside verges in Canberra and plans to extend that work.

In Victoria, the National Parks Service is using native grasses to revegetate an area of the new Organ Pipes National Park, 25 km north-west of Melbourne. The 78-ha Park, only recently taken over by the Service, was abandoned land until about 2 years ago. The revegetation project, led by Mr Bob Yorston and being carried out independently of the CSIRO work, aims at returning the area to its natural plant cover.

A weed-eradication program has been undertaken and now volunteers are reseeding part of the Park with wallaby and kangaroo grasses. Mr Yorston says the program so far has had mixed success, but the Service plans to continue in the light of new knowledge about the habits of the grasses.

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The CSIRO project is now completed, although the City Parks Administration is carrying out further trials. The findings so far can be summarized into a number of guidelines that may help parkland management authorities thinking of using native grasses.

- Harvested seed should be stored for at least 6 months before sowing.
- The most favourable time for sowing seed in the Canberra area is about November.
- Seeds should be treated before sowing —awns should be removed from kangaroo grass, awns and hairs from redleg and spear grasses, and husks from wallaby grass.
- Suggested rates of sowing for pure dense stands of the native grasses are 50 kg per ha for kangaroo, wallaby, and redleg grasses, and 100 kg per ha for spear grass.
- Suggested rates of sowing for a mixed stand containing all four native grasses are 12·5 kg each of kangaroo, redleg, and wallaby grasses per ha and 25 kg of spear grass per ha.
- Mulch the prepared seed-bed, preferably with native-grass straw cut from existing areas of natural grassland.
- Keep the seed-bed moist until emergence occurs.

More about the topic

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