Potential value of some *Bromus* species of the section *Ceratochloa*

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**Abstract** The paper discusses the potential agricultural value of 10 *Bromus* species in the section *Ceratochloa*. The species are bunch grasses poorly adapted to soils which are prone to waterlogging or are heavy-textured, very acidic, or have moderate to high levels of aluminium. They are moderately deep-rooted with good drought tolerance on better soils but require warm soil temperatures for reliable establishment. The seeds do not flow readily as they are generally large, light, and often have awns and fine hairs on the seed coat. The seed requires additional processing to be sown commercially. Forage is generally of high quality and palatability, and endophytic fungi are not a problem. Prairie grass (*B. willdenowii* Kunth) is a large-tillered short-lived, productive, winter-active species demanding very high soil fertility. It requires a long rotation interval between grazings and has poor tolerance to close continuous grazing. This inflexibility limits its role on farms. Grazing brome (*B. stamineus* Desv.) is a fine-tillered winter-active, perennial, drought-tolerant species with tolerance to close continuous grazing. This flexibility allows it to be used as a general-purpose pasture. It is best adapted to milder winter climates but not to regions with less than 400 mm or more than 1000 mm annual rainfall. *B. valdivianus* Phil. is finer-tillered and produces a denser sward with less winter growth, but otherwise is agronomically quite similar. *Bromus burkartii* Desv. is a fine-tillered winter-dormant perennial species with tolerance to close continuous grazing. It is potentially best adapted to colder winter climates such as in the mountain valleys of New Zealand and Tasmania. Annual forms of *B. carinatus* H. & A. with very high winter growth could be valuable in mediterranean zones of Australia. *B. sitchensis* may be valuable in cold winter regions. Three lesser known species *B. leptoclados* Nees., *B. runssorensis* K. Schum., and *B. lithobius* Trin. are also discussed briefly.

**Keywords** *Bromus* species; bunch grasses

**INTRODUCTION**

The genus *Bromus* comprises up to 400 species occurring throughout northern temperate regions of the world, tropical mountains, southern Africa, and South America. It includes many annual species, some of which are common weeds, as well as winter-dormant and winter-active perennials (Watson & Dallwitz 1992). The winter-active species of interest for Australia and New Zealand occur within the section *Ceratochloa* of this genus and this paper will discuss some members of this section.

The section *Ceratochloa* contains a number of perennial and annual species from South America, Africa, and western North America. Some species originating from climatic zones with milder winters can have seasonal growth patterns appropriate for use as forage plants in parts of Australia and New Zealand. The best known species of this section used commercially in Australia and New Zealand are prairie grass (*Bromus willdenowii* Kunth) and grazing brome (*B. stamineus* Desv.).

Many of the species within the section *Ceratochloa* are variable, poorly known, often difficult to identify, and have been known in various publications under different taxonomic names (Rumball & Forde 1976). Great care must be taken in accepting any published name unless further information to confirm the species' status is provided. Prairie grass (rescue grass in the United States), for example, is known under the names *B. catharticus* Vahl., *B. unioloides* H.B.K., and
B. willdenowii Kunth. However, the most valid name is B. willdenowii Kunth (Raven 1960), but even then a major source of confusion is that B. catharticus Vahl. can refer to a closely related but distinct species (Forde & Edgar 1995). Within this paper the names follow that of Forde & Edgar (1995) whereas for species not referred to in their paper, the names for Chilean species follow Matthei (1986).

This paper sets out to discuss the potential role of 10 Bromus species and is based on experiences and observations of the author over 17 years of evaluating over 300 accessions of these Bromus species in plant breeding programmes.

Although the species discussed are agriculturally quite distinct from one another (Table 1), they have the following features in common:

1. They are bunch grasses lacking rhizomes or stolons.
2. They are generally quite palatable with good herbage quality characteristics. There are no reports of troublesome toxins like those in phalaris or of endophytic fungi as with perennial ryegrass or tall fescue.
3. All would appear to lack tolerance to heavy soil conditions and soil waterlogging, preferring free-draining soils. They are also less tolerant of trampling and pugging damage than perennial ryegrass. They are intolerant of very acid soils and particularly of high aluminium (Al) levels.
4. They generally have large seeds, often with a long awn and short hairs on the seed coat. The combination of low bulk density and awns or hairs leads to poor or extremely poor seed flow characteristics. Although considerable variation exists between species, all would be likely to require some processing to enable seed to be sown readily with standard farm equipment. Even harvesting of seed may be a problem with some species. Those with exceptionally long awns and hairs on the seed could be a problem in wool and pelts.
5. It is probable that they all require warm soil temperatures (over 10°C) for rapid establishment.

**Prairie grass (Bromus willdenowii Kunth)**

The role of prairie grass on farms is providing high-quality high-yielding pastures lasting up to 3 years. Soil fertility must be high to very high and the soils must be free-draining, with a pH(\text{water}) over 6.0 and very low Al levels. The interval between grazing or cutting must be long, allowing sufficient regrowth between grazings. Prairie grass exhibits poor persistence under close continuous grazing. It is capable of providing very high winter production and has excellent tolerance to summer heat. In this role it can provide a valuable contribution as a special-purpose pasture in some farming systems, but it is unlikely to ever be used as a general-purpose pasture over large areas of a farm.

Prairie grass, or rescue grass as it is known as in the United States, originates from the Pampas region of Argentina and Uruguay, a region with mild winters and quite hot summers. It has very few large tillers and a very low vernalisation requirement. A high proportion of tillers become reproductive throughout the summer and the low

<table>
<thead>
<tr>
<th>Species</th>
<th>Tiller size</th>
<th>Winter growth</th>
<th>Heading date</th>
<th>Aftermath seedheads</th>
<th>Seed handling</th>
<th>Persistence (years)</th>
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<tbody>
<tr>
<td>willdenowii (prairie grass)</td>
<td>Very large</td>
<td>Very high</td>
<td>Medium</td>
<td>Many</td>
<td>Moderate</td>
<td>3</td>
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<tr>
<td>stamineus (grazing brome)</td>
<td>Medium</td>
<td>High</td>
<td>Early</td>
<td>Few</td>
<td>Poor</td>
<td>9+</td>
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<tr>
<td>burkartii</td>
<td>Med—small</td>
<td>Low</td>
<td>Late</td>
<td>Few</td>
<td>Moderate</td>
<td>9+</td>
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<tr>
<td>valdivianus</td>
<td>Med—small</td>
<td>Medium</td>
<td>Med—late</td>
<td>Very few</td>
<td>Poor</td>
<td>9+</td>
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<td>catharticus (slender)</td>
<td>Med—large</td>
<td>Med—high</td>
<td>Med—early</td>
<td>Many</td>
<td>Poor</td>
<td>3</td>
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<td>leptoclados</td>
<td>Med—large</td>
<td>Medium</td>
<td>Medium</td>
<td>Many</td>
<td>Moderate</td>
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<td>runssorensis</td>
<td>Large</td>
<td>Med—high</td>
<td>Early</td>
<td>Many</td>
<td>Very poor</td>
<td>3</td>
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<tr>
<td>carinatus (annual type)</td>
<td>Med—large</td>
<td>Very high</td>
<td>Very early</td>
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<td>Poor</td>
<td>1</td>
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<tr>
<td>carinatus (perennial type)</td>
<td>Med—large</td>
<td>Low</td>
<td>Late</td>
<td>Few</td>
<td>Poor</td>
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<td>stichensis</td>
<td>Very large</td>
<td>Low</td>
<td>Late</td>
<td>Few</td>
<td>Poor</td>
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<td>lithobius</td>
<td>Med—small</td>
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<td>Med—early</td>
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*aSeed handling—this refers to the species' ability to flow; species with seed of low bulk density, long awns, and with hairs on the seed have poor flow characteristics.*
number of vegetative tillers present severely limits its capacity to regenerate from many summer stresses. Its yield of forage can be very high but it is particularly noted for its high winter production (Langer 1962).

Prairie grass is best suited to very high-fertility soils. Its tillering is reduced under low fertility and on acid soils (I. T. Grigg pers. comm.). It also has a very poor tolerance to soil Al (Edmeades et al. 1991).

The fungal disease, head smut (Ustilago bulbata Berk.), is very common on prairie grass. This disease not only limits seed yield but also lowers yield and persistence in pastures (Falloon & Rolston 1990). In New Zealand, only seed crops free of smut are certified and seed is treated with a fungicide to combat this problem. However, older prairie grass pastures often become infected from adjacent areas of infected plants such as roadsides. This infection spreads and eventually leads to a decline in pasture performance.

Prairie grass is also susceptible to a range of diseases such as Cercospora scald (Cercospora bromivora), Ascochyta leaf spot (Ascochyta sorghi), Anthracnose (Colletotrichum graminicola), Fusarium leaf blight (Fusarium nivale), and to bacterial wilt disease Xanthomonas bromi (Latch 1965; Schmidt 1995).

Prairie grass has very limited capacity to survive continuous grazing and must be rotationally grazed or cut to persist in pastures (Langer 1962). This inflexible grazing management requirement limits its use to specialist high-performance paddocks on a small proportion of the farm.

Even under the best conditions, prairie grass seldom persists for more than 3 years and often the decline in plant numbers is very rapid. The cause of this rapid decline has been variously ascribed to poor grazing management, low fertility, pests such as Hessian fly (Mayetiola destructor), fungal disease epidemics such as smut, waterlogged soils, bacterial wilt, trampling damage, or a combination of these (Hume 1990; Stewart 1992). Prairie grass may also be more vulnerable to disease epidemics because of the narrow genetic base of cultivars brought about by its cleistogamous breeding system (Langer 1962). Many farmers allow reseeding to occur and this extends the life of some stands.

The herbage of prairie grass is of high quality with good digestibility and high soluble sugar levels (Parneix 1982), but it is lower than ryegrass herbage in calcium, magnesium, and iodine (Rumball et al 1972). Prairie grass is very palatable to stock, and, unlike many grasses, the seedheads are readily consumed by animals (Langer 1962).

Establishment occurs best when soil temperatures are over 10°C (Culleton & McCarthy 1983; Hill & Kirby 1985). The seed of prairie grass has short awns about 5 mm long, which are removed from commercial seed to enable it to be sown through conventional seed drills. However, even de-awned seed does not flow as well as ryegrass seed and care should be taken to avoid blockages, particularly with older worn equipment or with seed with a high moisture content.

The only cultivar available in Australia and New Zealand is ‘Grasslands Matua’; this is one of the most profusely tillering types available internationally. Overseas cultivars are often short-lived and unable to recover from grazing as well as Matua (Rumball 1974).

Grazing brome (Bromus stamineus Desv.)

The role of grazing brome is as a high-quality perennial pasture component. Soil fertility must be moderate–high and the soils must be free-draining, with a pH_{water} over 5.5, and with low Al levels. Grazing requirement is flexible as it may be either close and continuously grazed or rotationally grazed. It provides very high winter production and it has very good tolerance to summer heat. In this role it may provide a valuable contribution to farming systems as a general-purpose pasture but not outside regions with annual rainfalls less than 400 mm or greater than 1000 mm.

B. stamineus was originally believed to have originated from central Chile (Stebbins 1949). Although Matthei (1986) groups together the central Chilean collections of B. valdivianus under B. ustamineus, some authors group it with prairie grass (Moore 1983), and Forde & Edgar (1995) distinguish between the three species. A recent central Chilean Bromus germplasm collection carried out by New Zealand AgResearch contained B. valdivianus and others species but no B. tamineus (W. Williams pers. comm.) The seasonal growth pattern, vernalisation requirement, and flowering time of B. stamineus indicate that it comes from a region with warmer winters than B. valdivianus, with summers almost as hot as the original habitat of prairie grass. These characteristics suggest that it originates from Argentina, most probably from higher altitude and more northern inland regions than prairie grass. Further collections are required from this region to confirm this.
The only cultivar of *B. stamineus* available internationally is 'Grasslands Gala' (Stewart 1992), and the following discussion of the species' performance is generally based on this cultivar. It is a densely tillered type compared to the few other collections of this species that have been evaluated.

Its forage yield is higher than that of perennial ryegrass in dry regions of New Zealand (Stewart 1992) and Tasmania (Reed et al. 1995). This is most apparent in winter and dry summers (Stewart 1993). However, hard grazing of active growth in winter appears to be detrimental to subsequent spring production. The seasonal distribution of yield is ideal for many farming systems which have a feed deficit during winter and summer but which have a surplus in spring.

Grazing brome is a plant with many medium-sized tillers. It has a vernalisation requirement and produces very few aftermath inflorescences throughout summer (Stewart 1992). The large number of vegetative tillers present in summer and its natural heat tolerance (Laude & Chaugule 1953) enable it to persist, even though it is not a summer-dormant species (Laude 1953). It has a moderately deep root system and better drought tolerance than perennial ryegrass. In addition, it is able to survive the overgrazing which commonly occurs during drought.

Grazing brome is suited to moderate—very high soil fertility but exhibits better tolerance to low fertility than does prairie grass. It is intolerant of waterlogging and requires free-draining soils (Betin 1982; Stewart 1992). Its tolerance to soil Al is slightly less than that of perennial ryegrass but much greater than that of prairie grass (Wheeler 1995). Its tillering ability is probably also reduced on acid soils and it does not appear to be suitable for soils with a pH_{water} below 5.5.

Grazing brome is immune to current races of head smut (*Ustilago bullata* Berk.) which is a major problem in prairie grass. It is likely that many of the fungal diseases of prairie grass also occur on grazing brome (Latch 1965). It may also be infected with bacterial wilt (*Xanthomonas bromi*) although it is less susceptible than 'Grasslands Matua' prairie grass (Schmidt 1995). *Psuedomonas syringae* has been also identified as a secondary infection in several cases (M. Braithwaite pers. comm.).

As both grazing brome and prairie grass are cleistogamous and genetically less variable than ryegrass, it is possible that disease epidemics may occur more frequently and spread more rapidly than in ryegrass pastures.

Grazing brome is tolerant of close continuous grazing and is different to prairie grass in having this flexible grazing management requirement (Stewart 1993). It performs best when kept closely grazed to less than 15–20 cm height. It is one of the few species, except for perennial ryegrass, which provide this flexibility of grazing management. This feature allows it to be used as a general-purpose pasture on a high proportion of the farms in the regions and soils to which it is adapted.

Grazing brome has persisted for over 10 years in the regions where it is well adapted and can be considered a perennial. These regions have free-draining soils with a pH over 5.5 and low Al content, and have mild winters. In New Zealand, grazing brome has not persisted in regions with less than 400 mm or more than 1000 mm annual rainfall.

In mixtures, stock will frequently select grazing brome instead of tall fescue, cocksfoot, phalaris, and both endophyte-infected and endophyte-free perennial ryegrass. This can lead to overgrazing and care must be taken not to graze too closely or too frequently in winter as this can weaken the grazing brome and lead to dominance of other less winter-active companion species.

Grazing brome provides a very high-quality pasture throughout the year and is one of the better grasses for animal liveweight gains (Sutherland 1994). The crude protein content of 'Grasslands Gala' was approximately 1–2 percentage points higher than that for perennial ryegrass during winter (B. L. Sutherland pers. comm.). The magnesium content is similar to that of prairie grass (Rumball et al. 1972) but lower than that of ryegrass. The seedheads are less palatable than those of prairie grass but as grazing brome produces very few aftermath seedheads throughout the summer this is not so critical.

Grazing brome can establish more rapidly than perennial ryegrass (Fitzgerald 1994) but it would appear to be similar to prairie grass in requiring a soil temperature over 10°C. It should be noted that the seed size of both grazing brome and prairie grass is approximately 5 times that of perennial ryegrass yet it is common to sow at a similar rate (25–30 kg/ha). This reduction in the number of seeds sown per unit area provides much less tolerance to difficult or marginal establishment conditions. For this reason alone it is much more exacting in its establishment requirements than perennial ryegrass. Sowing depth is critical (Stewart & Grigg 1992) and sowing deeper than 15–20 mm is a common cause of establishment failure.
The seed of grazing brome has awns 8–10 mm long as well as hair on the seed. These must be removed by seed processing to enable sowing through conventional seed drills.

In Australia, *B. stamineus* has performed well in trials and on farms in parts of Tasmania (R. Reid pers. comm.), and persisted in trials on sandy soils in higher-rainfall regions of southern Western Australia (Saunders 1993a,b). In New Zealand, it has performed well in drier East Coast regions (Stewart 1993).

*Bromus burkartii* Desv.

*Bromus burkartii* Desv. (Matthei 1986), or *B. mango* as it is also known in agricultural trials in New Zealand and Australia (or *B. mango* var. *burkartii*) (Hernandez 1978), is common along the Andes of Argentina and Chile at altitudes of 1000–1500 m a.s.l. (Hernandez 1978; Matthei 1986). The climate of this region equates to that of New Zealand high-country valleys and the central highlands of Tasmania. Winters are moderately cold and summers are mild and dry.

It should be noted that the form of *B. mango* used as a cereal crop by the native Indians of Chile appears to have been very similar but Matthei (1986) considers it to be distinct from *B. burkartii* (*B. mango* var. *burkartii*).

*B. burkartii* is a perennial with smaller tillers than grazing brome, forming a sward with greater tiller density. It is later-flowering, with few summer inflorescences, and it exhibits much less winter and early spring growth than grazing brome, as could be expected from the cooler winter climate of its original habitat.

At present this species can be considered, from an agronomical point of view, to be a winter-dormant form of grazing brome adapted to similar soils but to climatic regions with cooler winters and probably some snow cover. It is also unlikely to have the heat tolerance of prairie grass or grazing brome. It may well offer some advantages over grazing brome in the New Zealand mountain valleys and central highlands of Tasmania. From its natural range it could be expected to survive better under snow than grazing brome.

The seed of *B. burkartii* is smaller than that of grazing brome or prairie grass, and lacks an awn, but still has dense hairs on the seed, giving moderate seed flow characteristics, but still poorer than those of perennial ryegrass. It is likely to require some processing before sowing.

Further trials are continuing in cooler parts of Australia and New Zealand to establish more precisely the potential of this species.

*Bromus valdivianus* Phil.

*B. valdivianus* Phil. is a Chilean perennial species occurring in pastures at lower altitudes between Concepcion and Puerto Montt, and as a roadside plant over a wider range (as described for *B. stamineus*, Matthei 1986). This region has a high winter rainfall with a moderately dry summer while temperatures equate to that of New Zealand and Tasmania.

In appearance this species is a smaller form of grazing brome and some publications group them together as either *B. stamineus* or *B. valdivianus* (Betin 1982). Forde & Edgar (1995) distinguish between the species.

In trials, *B. valdivianus* has slightly smaller tillers than grazing brome and it forms a sward with greater tiller density. It is later-flowering, with few summer inflorescences, and it exhibits less winter growth than grazing brome but more than *B. burkartii*. Rumball (1968) made similar observations. Because of its origin it could be expected to have less heat tolerance than grazing brome but it is likely to have a greater tolerance to wet soil conditions.

This species can be considered, from an agricultural point of view, to be a less winter-active form of grazing brome, with a higher tiller density and even greater tolerance to close, continuous grazing by sheep. In trials in Tasmania, it has performed well under this management (R. Reid pers. comm.). However, grazing brome also persists under this management and offers the advantage of greater winter production. In Chile this species has been compared to cocksfoot with promising results (Balocchi & Lopez 1995).

The seed of *B. valdivianus* is noticeably smaller than that of grazing brome. It has both an awn and dense hairs on the seed giving very poor seed flow characteristics. The seed therefore requires processing before sowing.

Further trials are continuing in Australia, New Zealand, and Chile to clarify the potential of this species.

*Bromus catharticus* Vahl. or slender prairie grass

The slender prairie grass (previously *B. unioloides* H.B.K.) referred to here is that described by Forde
& Edgar (1995). It occurs along the Andes in Chile and Argentina up to Peru, Ecuador, and Columbia. It is closely allied to prairie grass but is a more slender plant. It is a short-lived perennial species with finer tillers and greater sward density than prairie grass. Collections tested in New Zealand are earlier-flowering and spring cutting is followed by much aftermath heading in the summer, an observation consistent with its lower latitude origin. The temperatures of these regions are generally mild in winter but may be high in summer.

The early-flowering nature and low proportion of vegetative tillers in the summer appear to limit its ability to persist under stressful conditions. The species would not appear to be as persistent in New Zealand as *B. stamineus*, *B valdivianus*, or *B. burkartii*.

*Bromus leptoclados*  
*B. leptoclados* Nees comes from the highland areas of South Africa and Lesotho (Gibbs Russell et al. 1991).

It is a perennial species with tillers smaller than those of prairie grass. It is often found in moist shady areas. Although considered palatable by Gibbs Russell et al. (1991), many dairy farmers in Natal, South Africa, who have it occurring naturally on their farms, report that it is unpalatable compared to adjacent areas of grazing brome. The seed also has awns and hairs and would require processing for commercial sowings.

Further research is required on this species as it may well offer a number of different features to that found in the bromes of South American origin.

*Bromus runssorensis*  
*B. runssorensis* K. Schum. occurs in the tropical highlands of Ethiopia and surrounding areas. Clayton (1970) considers it to be a form of *B. leptoclados* as he believes there are no reliable characters for subdividing the species. However, in New Zealand, lines from Ethiopia perform very differently to *B. leptoclados* from South Africa. *B. runssorensis* lines are winter-active perennials with few large tillers. They are very distinct in having extremely hairy sheath bases. The tillers are slightly smaller than those of prairie grass and slightly more numerous. It flowers early and continues to produce numerous inflorescences over summer. The seed is light with a long awn and many hairs making it amongst the worst of these species for seed flow characteristics. Seed processing would certainly be necessary for commercial sowing, but the raw seed may not even flow well enough to allow traditional mechanical harvesting.

It has performed moderately well in trials both in New Zealand and Tasmania (R. Reid pers. comm.) but it does not appear to have many advantages over prairie grass or grazing brome. Indeed, the poor seed flow would be a considerable disadvantage.

*Bromus carinatus* H. & K. (California Brome)  
*B. carinatus* H. & A. is a native of California, USA (Munz 1974). However, it often merges with, and is difficult to distinguish from, *B. marginatus* which occurs further north into Canada; for this reason *B. carinatus* is often treated as a species complex (Rumball & Forde 1976).

There appears to be considerable variation within *B. carinatus*. Some forms from southern California behave as Mediterranean annuals in New Zealand with very strong winter growth and early flowering. These forms can produce more herbage than prairie grass and annual ryegrass during their short life.

Other more northern forms from moister summer climates are late to flower and have less winter growth than prairie grass but fewer aftermath seedheads (Rumball 1968; Betin 1982). These forms of *B. carinatus* have smaller tillers than prairie grass and behave very similarly to *B. marginatus* and *B. sitchensis* in New Zealand. This group can be considered to be a winter-dormant form of prairie grass with a similar pasture life and a similar inflexible grazing management requirement.

*B. carinatus* has been reported to be extremely susceptible to bacterial wilt (*Xanthomonas bromi*) and breeding work on this species was discontinued for this reason in France (Betin 1982).

The seed of *B. carinatus* has a long awn, is hairy, and is lighter than grazing brome. This gives very poor seed flow characteristics and processing would be required for commercial sowings.

Further research is required with this species, in particular on the productive annual forms of which only a few have been collected.

*Mountain brome (Bromus sitchensis Trin.)*  
*B. sitchensis* Trin. (still commonly referred to as *B. marginatus* Nees) comes from the Pacific northwestern United States and coastal British Columbia, Canada, a region with a colder winter than lowland
areas of New Zealand or Australia. The species consequently exhibits winter dormancy.

The only cultivar available is ‘Grasslands Hakari’. This is similar in tiller size and number to ‘Grasslands Matua’ prairie grass, but has much less aftermath heading. Its seed is slightly longer and narrower than that of prairie grass and requires processing for ease of sowing. The persistence of Hakari under grazing is very similar to that of Matua prairie grass. This species is suited to regions with colder winters than prairie grass, such as the intermontane valleys of the South Island, New Zealand. It can provide a short-term pasture giving large quantities of nutritional forage on the better soils but will require a rotational grazing management. In this role its is most likely to be used for lamb finishing during summer or as a palatable saved pasture for use in autumn-early winter (Rumball et al. 1987).

*B. sitchensis* is less heat-tolerant than prairie grass or grazing brome (Laude & Chaugule 1953) and has a poor tolerance to soil Al (Wheeler 1995). The naturalised New Zealand populations of *B. sitchensis* are often susceptible to rust (*Puccinia* spp.) (Forde & Edgar 1995) although ‘Grasslands Hakari’ has good resistance (Rumball et al. 1987). Mountain brome is also susceptible to head smut (*Ustilago bullata* Berk.) (Falloon et al. 1988) although less susceptible than Matua prairie grass (Rumball et al. 1987).

**Bromus lithobius** Trin.

*B. lithobius* Trin. (previously known as *B. fonkii* Phil.) is a native species from Chile which is now extremely common in New Zealand and southern regions of Australia, particularly along roadsides (Forde & Edgar 1995). It is commonly found in low-fertility, infrequently mown turf areas, particularly on lighter soils. Although never sown, it frequently becomes dominant in these areas over a period of 20 years or more, regardless of which species were sown originally.

It forms a rather uneven light yellow-coloured turf and in forage trials it has a low yield. It is winter-active with fine tillers forming a very dense sward, and it flowers relatively early. It is probably the *Bromus* species most tolerant of low soil fertility. Its potential as a forage species would be limited but finer-tillered forms could have potential for low maintenance turf.

There are numerous other species of the section *Ceratochloa* of *Bromus*, many of which have not been evaluated agronomically in New Zealand or Australia. Of those tested to date, the species discussed would appear to be the most promising. As with any introduction of new forage species and accessions, those most likely to succeed will originate from homoclimatic zones with similar edaphic conditions. A comparison of such homoclimatic zones would be useful in determining where in New Zealand or Australia each species has the greatest potential.

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