Weeds of the Burdekin Rangelands:

Managing parthenium

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Table 1 Preventing new weeds from establishing

Summary of key processes: what do we know?

What are the key bio-physical processes and at what scale do they operate?	What factors regulate them, in order of importance? Are they 'manageable'?	Do we have enough data to set benchmarks? Do these vary with land types and/or seasons?
Seed production	Soil moisture—seed production can continue while soil moisture levels are favourable; this factor cannot be managed. Biological control agents—a weevil that has been released directly targets reproductive potential; it is established but does not have a large impact on the weed; a rust can reduce flower production by 90% but is not well adapted to north east Queensland; the impacts of these agents, once established, cannot be managed.	Control actions should be timed so as to prevent or reduce seed production.
Dispersal	Wind—usually only short-distance transport; the process cannot be managed. Water—the plant does well along water courses and seed may be washed downstream. Livestock and other animals—can transport seeds in mud on their coats; some action can be taken to reduce this risk. Motor vehicles—seed has been transported long distances feral pigs; parthenium is dispersed by feral pigs, wallabies and some birds; most of these factors cannot be managed; feral pig control programs will reduce the risks.	This should prompt catchment level strategies to manage this weed. There is sufficient information to form protocols and establish practices for controlling dispersal via livestock. There is sufficient information to form protocols and establish practices for controlling dispersal on vehicles and farm machinery.
Germination	Seed-bank age structure—surface seed is short-lived (2 years); buried seed may live 4-6 years; it may be possible to bury seeds by cultivation. Seasonal conditions—in the Burdekin Rangelands, most germination is likely to occur with the first rains of the wet season but 'out of season' rains may also lead to germination; this process cannot be managed.	Cultivation is not generally appropriate for most of the Burdekin Rangelands.

Table 1 Preventing new weeds from establishing (cont.)

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Plant growth and survival	Climate—parthenium is an annual but may produce up to 4 cohorts in a good season; the drier the season, the shorter-lived the plants; this factor cannot be managed. Sown pastures—vigorously growing perennial pasture species may be sown to compete with parthenium. Fire—may be effective when early wet season burning is used in conjuction with other control methods. Competition—healthy perennial grass pastures compete with parthenium; the herbaceous layer can be managed appropriately. Biological control—a number of leaf and stem feeding insects have established through biocontrol programs against parthenium; at least 6 species of insects and a rust are well established; little can be done to increase the impact of those already released; additional agents may become available.	Healthy pastures of species such as buffel grass will be resistant to invasion by parthenium. It can be difficult to burnt areas that are heavily infested with parthenium. Guidleines for maintaining healthy perennial grass pastures are available for the Burdekin Rangelands. A stem-galling moth reduces the growth and seed production of parthenium

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Table 2 Key processes for management		
Management Options		
Based on current scientific understanding, what management options are available to achieve the objective? How can we monitor their effectiveness?	What confidence do we currently have in these options?	Do the options conflict or interact with other management objectives? Will trade-offs be needed?
Continue biological control programs for parthenium.	New agents can be identified, introduced, released and established; we can be less confident about how effective those agents will be.	Biological control is generally compatible with other management objectives and with other weed control options. It is important to ensure that, while new agents are establishing, they have access to adequate populations of their host weed.
Monitor to detect downstream incursions as a result of water-aided dispersal. Monitoring should target areas of suitable habitat downstream from known infestations.	Success in this action will limited only by capacity to find and identify new infestations.	It is important that all land managers within the Burdekin Rangelands are able to identify parthenium. Monitoring can be time-consuming but may be carried out in conjunction with other activities (eg mustering). New infestations should be treated immediately.
Monitor to detect movement of parthenium along roadsides.	Success in this action will limited only by capacity to find and identify new infestations.	As above.
Develop and implement protocols and facilities for minimising the risk of cattle-aided dispersal across fence lines.	Suitable protocols will be effective in greatly reducing the risk of spread.	Effective protocols will place some restrictions on the movement of livestock for sale or agistment.
Develop and implement protocols and facilities for minimising the risk of transport of seed on motor vehicles and farm machinery.	Suitable protocols will be effective in greatly reducing the risk of spread.	These protocols will impose some costs (time and $) to ensure vehicle hygiene.
Maintain vigorous populations of desirable perennial herbaceous species.	This will reduce the risk of parthenium invading gaps. .	Maintaining healthy perennial grass pastures as a means of weed management is consistent with sound land management.
Use appropriate chemical and mechanical control techniques.	Reliable chemical and mechanical control techniques are available for all three species; existing stands of parthenium can only be reduced by using chemical and mechanical techniques.	Chemical and mechanical control techniques are expensive. Herbicide techniques (e.g. basal bark spraying, cut stump applications) must be applied to individual plants. So must some mechanical techniques. Efficiency will rely on targeting outlying and small infestations, those likely to be serious seed sources, and infestations in key areas .