The effect of fire and herbicide on rubber vine (*Cryptostegia grandiflora*) in Bowling Green Bay National Park, Queensland

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Summary Rubber vine (*Cryptostegia grandiflora*) is one of Queensland's major woody weeds. Its aggressive climbing habit ultimately excludes all other native plants through shading and competition. Queensland Parks and Wildlife Service (QPW) have been experimenting with the use of fire and herbicide to reduce rubber vine populations in salt pans and eucalypt woodland in Bowling Green Bay National Park. Both burning and herbicide treatments reduced rubber vine dramatically in both habitats. The distribution and density of rubber vine determines which methods may be appropriate for its control. Fire can be used to kill a large proportion of rubber vine growth and encourage grass and herbs to grow, thus creating a higher intensity fire in the following year. Herbicide can be used in conjunction with fire to complement the woody weed control especially where dense infestations occur.

Keywords Fire, QPW, rubber vine, weeds.

INTRODUCTION

Rubber vine (*Cryptostegia grandiflora* R.Br., Apocynaceae) has caused considerable losses to native vegetation by smothering both the ground and tree layers. There has been much research done regarding fire and herbicides on rubber vine management and control (Bebawi and Campbell 2002, CRC 2003, Department of Natural Resources, Mines and Energy 2004). Queensland Parks and Wildlife Service (QPW) have been conducting various experimental regimes using both fire and herbicide to reduce rubber vine on a number of parks, particularly Bowling Green Bay National Park.

Fire can kill a large percentage of rubber vine but burning can be difficult, especially if fuel load is minimal, or inappropriate in some situations (e.g. fire sensitive flora, fauna or cultural sites may exist within the rubber vine infested area). Also staff may be unavailable when favourable conditions occur for burning. Therefore this study investigated burning and one herbicide option for rubber vine control.

MATERIALS AND METHODS

Bowling Green Bay National Park is located approximately 20 km south east of Townsville in north Queensland (19°30'S, 147°00'E). Six monitoring sites (A–F) were established in Bowling Green Bay between 2004 and 2005. These were given a vegetation description using a regional ecosystems (RE) classification scheme. Regional ecosystems (defined by Sattler and Williams 1999) are vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil and are the bioregional planning framework used in Queensland (Environmental Protection Agency 2007).

Of these six sites, three (St Heliers A, B, C) consisted of mixed Eucalypt woodland with a grassy understorey (*Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult and *Sporobolus virginicus* (L.) Kunth, Regional Ecosystem 11.3.35) and were established in December 2004. In June 2005, a further three sites were set up in the salt pan (Cocoa Ck (D, E) and Jerona (F), dominated by the salt couch – *S. virginicus* RE 11.3.31). Sites A–E, were established to monitor the effects of fire on rubber vine whilst F (unburnt) was to monitor herbicide effects on the infestation.

Five transects (A–B, D–F) were 25 m in length × 4 m wide and one (C, in woodland) was 10 m × 10 m. Rubber vine plants were counted in each of the five sites (A–D), prior to and post burn and combined with photo points. Data are not available for F and estimate from photographs used.

At Jerona (F), rubber vine was treated by basal bark spraying using a mixture of Access® and diesel at 18 mL per L in 8 L spray containers. Basal barking is a process of applying herbicide right around the base of the stem to ~30 cm up the stem, ensuring that any other vegetative matter is cleared from the stem base prior to spraying. Herbicide treatment was applied in mid June 2005 with plants re-treated as necessary (using same herbicide methods) in February 2006. Pre- and post-herbicide treatment photographs and post-herbicide counts were used to evaluate the effectiveness of the herbicide on rubber vine at F. Pre-herbicide counts were not available for this site.

A range of fire methods were used including on ground using drip torches (2004–05) and aerial incendiary (2005). Aerial ignition operations involved the dropping of aerial incendiaries (ethylene glycol

injected into small plastic balls containing potassium permanganate that ignite approximately 30 seconds later and burn for a minute or so afterwards). Fires were lit around midday with moderate-high fire intensity. Moderate intensity was represented by most of the ground stratum burnt, some scorch in the mid-stratum and little or no canopy scorch; for high intensity, the ground stratum was burnt completely (or nearly so) and at least some canopy scorch.

All sites had a 50–70% grass curing rate except Cocoa Ck (D, E) which was 80%. Fuel curing is a measure of grass greenness and relates to the percentage of dead grass material in a given area (Johnson 2002).

St Heliers sites (A–C) were burnt (moderate fire intensity) in mid December 2004, and again in late October 2005 with an air temperature of 31.5°C and relative humidity of 56.7%). At Cocoa Ck (D–E), a high fire intensity ensued as a higher fuel load was present. The Cocoa Ck sites (D, E) were burnt once in mid October 2005 with a recorded temperature of 33°Celcius.

The Jerona plot (F) data (Table 1) only contains photo monitoring data and post herbicide counts.

RESULTS

Both burning and herbicide treatment of rubber vine plants were effective in reducing rubber vine at the six monitoring sites. The three St Heliers sites (A–C) sustained a 74%, 84% and 100% kill of rubber vine respectively. Cocoa Ck sites each sustained 100% kill (Table 1). To date there has been no rubber vine seedling recruitment in any of the six plots. A single native vine, *Gymnanthera oblonga* ((Burm.f.) P.S.Green) – Apocynaceae, was present in the burnt plot in 2004 and survived the fire. The two herbicide applications within the Jerona photo monitoring site eradicated rubber vine (Table 1).

To kill resprouting rubber vine at the St Heliers sites, QPW scheduled a planned burn for that area in November-December 2007. Unsuitable weather conditions prevented this burn occurring in 2007, thus it will be implemented when suitable conditions ensue during early 2008.

DISCUSSION

One or two fires of medium to high fire intensity appear to have successfully controlled rubber vine at all sites (Table 1). In contrast, the native vine *Gymnanthera oblonga* growing in Site A survived repeated fires. At the sites where the fuel curing rate was high (80%), all rubber vine plants were killed. This is consistent with results from Bebawi (1999) who found that a single burn killed 80% of rubber vine plants on Wrotham Park, a cattle station 70 km west of Chillagoe, Queensland. In that study, a second burn was undertaken in the following year giving a 99% kill.

The herbicide Access® killed all rubber vine plants when applied as a basal bark spray.

Within a large organisation such as QPW implementing a planned burn can be complex. Staff may be undertaking various jobs at any one time and each week is set aside for different jobs on different parks, therefore, flexibility in attempting to burn with the required staff and burn conditions can be tricky. If a planned burn has to be rescheduled many times for any of the above reasons, one has to weigh up the most practical method for removal of rubber vine. If left for too long, the rubber vine will smother out the grass layer, thus reducing fuel loads. Herbicide (basal barking) is best applied where rubber vine infestations are dense and fuel loads are low. This method is less dependent upon suitable weather conditions than is burning.

In monitoring the experimental sites, we have learnt that there is a fine balance between collecting sufficient data to support our weed management techniques and ensuring that the effort is not too time consuming for rangers. This is especially the case with staff turn over within QPW. Monitoring site data

Table 1. Numbers of rubber vine plants pre and post-fire treatments in Bowling Green Bay National Park and their percentages killed.

	Pre-fire 2004	2005	2007	% kill
St Heliers A	100	26	26	74
St Heliers B	55	10	9	84
St Heliers C	5	0	0	100
Cocoa Ck D	–	29	0	100
Cocoa Ck E		21	0	100
Jerona F		10–15[A]	0	100

[A] Estimate of plant count before herbicide treatment

(especially regarding fire and weeds) needs to be recorded with long term goals in mind and to be able to build upon that data for future park management.

When one weed is controlled, care must be taken not to allow another suite of weeds to replace the original one. It is important to choose the most suitable treatment for each area. Both burning and applying herbicide (basal barking) worked equally well in achieving a dramatic reduction of rubber vine plants over the six sites in Bowling Green Bay National Park.

Both methods used in this study allowed grasses and herbs to regenerate. Fire may be inappropriate to use in some situations (e.g. dense infestations of rubber vine where fires will not carry as a result of minimal fuel; fire sensitive flora or fauna; or cultural sites). Suitable weather conditions are also necessary. Herbicide applications do not have the same limitations.

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