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MODELLING *Parkinsonia aculeata* INVASIONS AT THE CATCHMENT SCALE

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ABSTRACT

To effectively manage weeds, information on the individual species' distribution and habitat is required. Both habitat and distribution can be described at a range of scales. In this study the objective was to describe and understand the distribution of *Parkinsonia aculeata* within the Cape River catchment of North Queensland. Generally, *P. aculeata* occupies flood prone and riparian areas. An aerial survey for *P. aculeata* was conducted to ascertain the weed's distribution in the Cape River catchment. More *P. aculeata* was found in the downstream portion of the catchment. Following this survey, habitat characteristics were derived from Landsat imagery and soil surveys using a geographic information system. The distribution characteristics of the weed were also derived using neighbour methods. A classification and regression tree was employed to determine which habitat and spread variables influenced the distribution of *P. aculeata* within the Cape River catchment. Generally, the presence of *P. aculeata* was influenced by spread characteristics, soil type and the proximity of the weed to the riparian zone. The model may be used to facilitate catchment scale management of *P. aculeata* and this is discussed.

INTRODCTION

Parkinsonia aculeata is an invasive woody weed that, under favourable conditions, can grow 7 m high. It is found in the rangeland areas of the Northern Territory, NSW, Queensland, South Australia and Western Australia. *P. aculeata* generally invades riparian zones and flood prone areas and is principally spread by water.

To successfully manage *P. aculeata* its spatial distribution must be considered at the catchment scale and knowledge of the weed's distribution throughout a catchment is useful. In this study, catchment scale information distribution of *P. aculeata* was combined with habitat and spatial information to build a predictive model of *P. aculeata* invasion for the Cape River catchment of North Queensland. The model outputs can help devise a rule based catchment scale management strategy for *P. aculeata.*

METHODOLOGY

The principal rivers and associated tributaries of the Cape River were aerially surveyed and the presence of *P. aculeata* recorded with a GPS. This process is described in detail elsewhere (Lawes *et al.* 2003). The Cape catchment had previously been surveyed and data were available for soil type and geology. These data were transferred to a 500 m grid and allied with the *P. aculeata* survey data.

For each *P. aculeata,* six spatially explicit variables were calculated. These included the distance to its nearest neighbour upstream, downstream and in any direction. The number of instances when *P. aculeata* was present upstream, downstream and in any direction at 1 km, 5 km and 10 km were also calculated. Other variables included the distance from the river and distance from the mouth of the Cape River. A regression and classification tree was employed to describe the distribution of *P. aculeata* in the catchment in relation to habitat and spatial variables.

RESULTS

Parkinsonia aculeata has invaded a relatively small portion of the catchment and was present at only 708 of the 7947 grid positions surveyed. The error rate of the model was small, at 6.04% and was achieved because the model correctly predicted *P. aculeata* absence. There were only 177 false

positives. *P. aculeata* presence was harder to predict, with only 462 of the 708 *P. aculeata* locations correctly predicted. There were 11 nodes to the regression and classification tree and six possible pathways through the tree (Figure 1). Of these, one indicated that *P. aculeata* would be present on 71% of occasions and another that it would be present on 43% of occasions. The remainder resulted in either low (<16%) or very low (<1%) chances of *P. aculeata* presence in the Cape River catchment. No pathway predicted *P. aculeata* absence with 100% accuracy.

P. aculeata was present at a given location (71% accuracy) if all the following criteria were met:

- There were at least 3.5 instances where *P. aculeata* was present within 1 km.
- The given location was situated on either a clay to loam soil, or close to the river.
- There were at least 19.5 instances where *P. aculeata* was present within 5 km.

Alternatively, *P. aculeata* was present at a given location (43% accuracy) if:

- There were less than 3.5 instances where *P. aculeata* was present within 1 km.
- There was still *P. aculeata* present within 600 m.
- The given location was less than 250 m from the river bank.

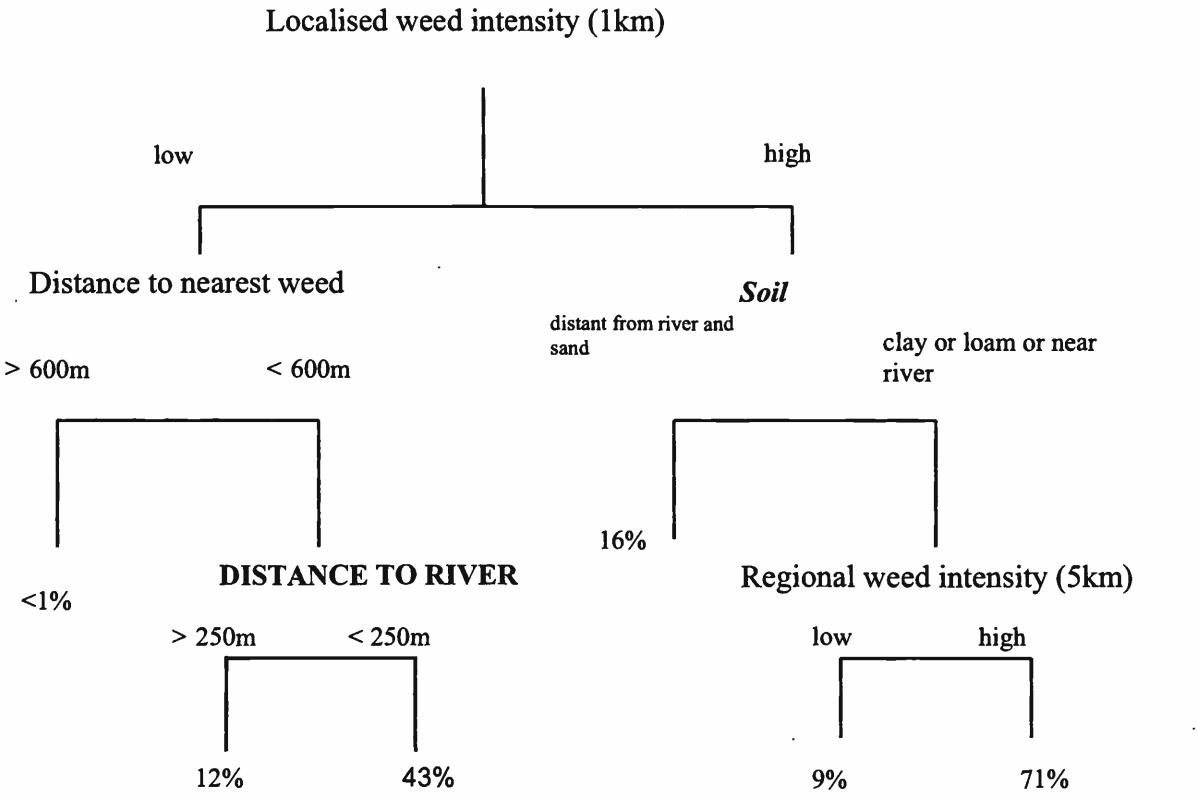

Figure 1. A regression and classification tree that describes the distribution of *Parkinsonia aculeata* in the Cape River Catchment of North Queensland.

CONCLUSION

A regression and classification tree has been used to evaluate the distribution of *P. aculeata* in the Cape River catchment of North Queensland. This methodology enabled habitat and spatial characteristics to be combined. It suggests the invasion process is localised, but if left unmanaged *P. aculeata* would eventually occupy most of the riparian zone.

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