Managing Watsonia invasion in the threatened plant communities of south-west Australia's clay-based wetlands.

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The Seasonal Clay-based Wetlands of South-west Australia

While the majority of seasonal wetlands in south-west Australia are connected to the regional ground water, there are a series of wetlands found on clay substrates that rely solely on rainwater to fill. These wetlands are characterised by temporally overlapping suites of annual herbs that flower and set seed as the wetlands dry through spring. Over summer the clay substrates dry to impervious pans. The plant communities of clay-based wetlands comprise a flora of over 600. At least 50% are annual or perennial herbs, 16 occur only on the clay-pans and many are rare or restricted (Figure 1).

The seasonally inundated clays that support these communities are relatively productive agricultural soils and many were cleared soon after settlement. Those that remained intact were largely located on the Swan Coastal Plain in close proximity to metropolitan Perth. In more recent years large areas have disappeared under urban development and today the plant communities of seasonal clay-based wetlands are amongst the most threatened in Western Australia.

The small and fragmented nature of these remaining wetlands leaves them vulnerable to a range of threatening processes. In particular weed invasion, specifically by the South African geophyte Watsonia (*Watsonia meriana* var. *bulbillifera*), is a major threat. Watsonia can disperse via cormels (tiny corms that develop along the flowering stem at the end of the flowering season), into relatively undisturbed bushland remnants, forming dense stands that effectively displace the diverse herbaceous understorey (Figure 2).

Study Site and Field Methods

Meelon Nature Reserve, a remnant clay-based wetland on the eastern side of the Swan Coastal Plain 200 km south of Perth, has been the focus of a three year study investigating possible management techniques for Watsonia where it is invading these communities. Specifically, we investigated the effectiveness of the herbicide 2-2DPA (Dalapon®, Propon®) in controlling populations of Watsonia. The investigation addressed the impacts of the herbicide on native flora of a clay-based wetland, the response of the native plant community to Watsonia removal and then the compounding impacts of fire on the regeneration process.

In August 2005 before the herbicide trials were established, the density of Watsonia across the reserve was mapped. Five permanently marked transects were then established in an area of the wetland where the cover of Watsonia was estimated to be greater than

75%. Thirty 1m x 1m quadrats were placed along the five transects and the cover of all native and introduced taxa recorded.

The herbicide 2-2DPA (10g/L) + the penentrant Pulse® (2.5 mL/L) was applied from a backpack unit in September 2005. Herbicide application on invasive geophytes such as Watsonia should take place just as the underground storage organ is exhausted and this often co-insides with flowering. For Watsonia in south- west Australia corm exhaustion generally occurs in the month of September (Figure 3).

Results

One year after the initial treatment, a 97% reduction in the cover of Watsonia was recorded and importantly there was little evidence of serious off target herbicide damage to the native flora. There was a decrease in cover of some native species but none were lost. The herbicide treatment was followed up in September 2006 on the few Watsonia left.

The following summer, February 2007, an unplanned wild fire burnt across the reserve and through the study area. In September 2007 a significant increase in the cover and diversity of native species was recorded across the site. Some species such as the *Dichopogon preissii* had not been recorded at all before the fire, others, such as the native sedges, *Cyathochaeta avenacea* and *Chorizandra enodis* and a number of native geophytes including *Chamaescilla gibsonii*, *Tribonanthes australis* (Figure 4) and *Burchardia multiflora* increased greatly in cover following the fire. .

Importantly, the cover of Watsonia had been reduced from greater than 70% in 2005 to less than 1% by 2007 and there was no re sprouting or recruitment from cormels or seed following the fire.

Conclusions

The fire was an unplanned event and it burnt across the entire study site. It is therefore difficult to separate the effects of Watsonia control from the effects of the wildfire. Nevertheless it seems clear that the 2-2DPA was effective at controlling Watsonia, that the off target damage to native flora was not significant and that fire then triggered regeneration of the native plant community through germination of the soil seed bank and re sprouting of various storage organs.

These initial results are promising for management of Watsonia invasions in these clay-based wetlands. Indications are that once Watsonia has been killed the communities have the capacity to regenerate with fire potentially playing a significant role in the process.

A Word of Warning

While fire could be a useful tool in the restoration of clay-based wetlands it is also probable that it plays a significant role in the invasion of Watsonia into these plant

communities in the first place. There is evidence from South Africa, where Watsonia occurs naturally, that plants flower particularly well following fire. This leads to prolific cormel or seed production. The cormels are produced towards the end of the first growing season after fire and then germinate en mass with the first autumn rains of the second season. In the parts of Meelon Nature Reserve, outside of our study area where Watsonia had not been controlled, we observed prolific flowering following the fire. It will be interesting to see if this leads to recruitment in our study area in 2008. Fire should only be considered as a management tool where Watsonia control has been comprehensive and complete across sites.

Spreading the word.

The study has been a collective effort involving staff from across the Department of Environment and Conservation and members of the local Dwellingup community. In September 2007 a workshop and field day was run in conjunction with the Waroona Land Care Centre for land managers in the region. The day provided the opportunity to share the results of our work and to provide advice to local landholders, many closely involved in the management of plant communities associated with clay-based wetlands.

References

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