In any ecological survey, there is a chance that a species occupying a site will not be detected during a survey of that site. If it's an animal it might be because it isn't there when you're looking (eg, it's foraging elsewhere for food), or it might be hiding from you. Plants can't move about but they may have cryptic or complex life histories that mean they are not visible at certain times (eg, like seeds and bulbs). And, of course, there is always the chance that the observer may simply fail to see a plant or animal that was present.

While many ecologists are aware of issues of imperfect detection during biological surveys, policy has yet to catch up with this issue. It's still the default assumption of most.
The spiny rice-flower: A case study in imperfect detection!

The spiny rice-flower is a small shrub found in Victoria’s native grasslands. It produces small, creamy flowers (see below), and unlike most grassland plants, flowers in the cooler months between April and September. The shrub resprouts after fire but is rarely known to regenerate from seed. Listed as critically endangered under the EPBC Act, it continues to be directly threatened by habitat loss and fragmentation.

Detection of this species may be hampered by high densities of surrounding grasses and small individual plant sizes.

I recently spent 45 minutes searching around the base of the shrubs in the photo on the right in an area where I had been told *Pimelea spinescens* was present. However, I failed to detect it.

When I was eventually shown the plant I had been searching for (bottom right), it was clear why it had been so difficult to find; it was almost completely covered by dense *Themeda* – near-impossible to see unless you were standing right on top of it.

Detectability and search effort

(Continued from page 3)

Environmental impact assessments that a species that is present at a site will be detected during a survey of that site. A number of modelling methods now exist for characterising species’ detectability, some of which enable us to determine how many repeat surveys are required to be confident of detecting a species if it is present (Wintle et al., 2005). My interest is a variation on this: How long do we need to spend surveying in a single visit to a site to achieve a reasonable chance that we will detect a threatened plant species if it’s present (Garrard et al., 2008)?

My PhD research has investigated detectability issues in the Western (Basalt) Plains grassland community on the northern and western fringes of Melbourne. With less than 0.1% of its original extent remaining, this vegetation community is listed as critically endangered under the EPBC Act. However, it exists in close proximity to Melbourne’s urban growth boundary, and there is continual pressure for development in areas where remnants occur*. One of the inadequacies of surveys undertaken for impact assessments is their capacity to determine the presence or absence of threatened species in the area. This information is essential if good strategic land use decisions are to be made in this region.

The Western (Basalt) Plains grassland is home to a number of nationally-endangered plant species, including the spiny rice-flower, *Pimelea spinescens* subsp. *spinescens* (see box). As part of my study, I was interested in determining how ‘detectable’ this species was during a flora survey, what types of factors affected the probability it would be detected and how long we need to spend looking for it to be sure we’ll find it. During a multi-site, multi-observer field study undertaken over two spring seasons (2006 and 2007), I collected data on the time at which this species was first detected in 1 ha plots. I also looked at variables that were likely to influence the rate of detection, such as the experience of the observer, the date and time of day, weather conditions and the cover of the dominant grass species, kangaroo grass (*Themeda triandra*).

What I found suggests that the chance of failing to detect this species is potentially very high. Even at sites where the species was known to exist, only around half of the observers detected it. The average time to detection was strongly influenced by observer experience and the
cover of Themeda at the site, with detection times lower for observers with experience in Western (Basalt) Plains grassland surveys and at sites with lower Themeda cover. There was also evidence that the date of survey affected the time needed to detect this species.

So, how hard do we need to look for this species? Under the most favourable survey conditions, the average time to detection is 26 minutes per hectare. But if we want to be 80% certain that we will detect the species if it is present, we need to allocate around 42 minutes per hectare. And to increase this certainty to 95% requires a survey effort of 78 minutes per hectare. However, the survey effort required to achieve a reasonable probability of detecting the species if it is present may increase significantly under sub-optimal survey conditions. For example, to achieve a 95% probability of detection using a less experienced observer would increase the survey effort required to over 2 hours per hectare. Under the average conditions experienced during my field study, the average time to detection of this species was around 3.5 hours per hectare. Importantly, this is significantly higher than the level of effort commonly expended during ecological impact assessment surveys in the region.

The Federal Government has recently introduced survey effort recommendations into the Significant Impact Guidelines for the critically endangered spiny rice-flower (DEWHA, 2009). These guidelines suggest that all surveys for this species should be undertaken by experienced observers at a suitable time of year and specifying that where recommended survey conditions cannot be observed, the responsibility must be on the proponent to demonstrate that survey effort should be increased to accommodate the associated decrease in detection probability.

I hope that my research can help to further refine these suggestions and develop minimum survey effort requirements. However, the adequacy of survey effort expended during ecological surveys can only be determined when that survey effort is explicitly documented and current reporting standards for ecological impact assessments are often insufficient to obtain accurate estimates of survey effort. For the positive changes demonstrated by the Australian Government to have a meaningful effect, they must be accompanied by an improvement in the way in which survey effort is reported and the capacity to enforce minimum survey standards.

More info: georgia.garrard@rmit.edu.au

References


*Under the expansion of the urban growth boundary recently proposed by the Victorian Government, 7,000 ha of Western (Basalt) Plains Grassland would be lost (See Decision Point #32 and DSE, 2009).