# 'Sleeper weed': caution, use only as directed

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**Summary** This paper considers the category 'sleeper weed' which has been used and misused extensively since Groves coined the expression. The term arouses fear that naturalised exotic plants may become invasive, but, in the absence of reliable criteria for prediction, lacks utility in weed science. Despite Groves' subsequent caution, misuse of the term has continued. It is concluded that it would be preferable not to use the term.

**Keywords** Sleeper weeds, misuse, fear, avoidance.

## INTRODUCTION

In what appears to be a logical extension of lag phase theory, Richard Groves (1999) suggested that some naturalised exotic plants in Australia, although not invasive to date, may at some future time become invasive. He coined the expression *sleeper weed* as a label for 'invasive plants that have naturalised in a region but not yet increased their population size exponentially.' The term sleeper weed was quickly taken up, and has had wide usage.

The term is problematic, however; not least because of the inability to identify which naturalised exotics may become invasive. Criteria for inclusion of a species in the category have not been established. There is no reliable way of knowing which of the more than 2500 naturalised species in Australia that have not become invasive are *sleeper weeds* if, indeed, any are.

## DISCUSSION

Sleeper weeds, as plants which have the potential to become weeds, feature largely in current weeds discourse (Groves *et al.* 2005). There is a tendency for any naturalised species that is not obviously increasing or spreading rapidly to be called a sleeper weed.

The term has also been applied to new and emerging weeds which may not yet be naturalised. For example, the Commonwealth Bureau of Rural Sciences has produced a list of Priority Agricultural Sleeper Weeds (Cunningham *et al*. 2006). The species represented in Victoria were: Urugayan ricegrass (*Piptochaetium montevidense* (Spreng.) Parodi), chilquilla (*Baccharis pingraea* DC.), Uruguay or lobed needle grass (*Nassella charruana* (Arech.) M.E.Barkworth), water dropwort or meadow parsley (*Oenanthe pimpinelloides* Sm.), Taurian thistle (*Onopordum tauricum* Willd.), orange hawkweed (*Hieracium aurantiacum* L.), and square-stalked St John's wort (*Hypericum tetrapterum* Fr.). Some of these weeds are not naturalised in Victoria. Some are restricted to few sites.

Grice and Ainsworth (2003) published a thorough critique of the concept, suggesting that many factors may be involved in the success or failure of exotic plant populations and pointing out the possibilities for misunderstanding inherent in the sleeper weed concept. Groves (2006) has acknowledged some of the difficulties, and suggested some criteria, including a requirement of naturalisation for at least 50 years. Under this test, the plants specified above are not sleeper weeds.

Of the 2500 or more naturalised aliens in Australia, only 200–300 have become seriously invasive. It is not suggested by Groves that all or even the majority of the naturalised aliens are likely to become invasive. Groves (1986) accepted that of the thousands of plants which have been introduced, relatively few (perhaps less than 10%) have naturalised and fewer still (perhaps less than 2.5%) have become weeds. How are the sleepers among the naturalised plants to be identified?

Groves (2006), in discussing the problem of identifying which naturalised plants are sleeper weeds, referred to drooping or downy brome grass (*Bromus tectorum* L.), which is highly invasive in the intermountain region of the USA. Although naturalised in Australia and New Zealand for at least 50 years, it has not become invasive at sites climatically analogous to the regions of the USA where it is invasive. The question, as Groves asks, is 'Are these scattered Australasian populations best regarded as sleeper weeds with potential for further expansion or as naturalised populations that may never increase?' He is unable to answer this question in the case of *B. tectorum*. But the question is of general application. Without an answer, there seems little point to the category. An equally important question is 'Why has *B. tectorum* not become invasive in Australia, given its history in the USA?'

Even in retrospect it is not easy to determine which plants have been sleepers. The difficulties

which Cousens and Mortimer (1995) identified in 'lag' phase theory apply. They demonstrated that it may be impossible to say whether data should be interpreted by a two phase linear graph depicting a low and high rate of population increase or by an exponential curve of constant rate of increase. Groves (2006) described this as a 'mathematical problem' about determining the point of inflexion at which the rate of increase changes abruptly, and acknowledged that it may be 'even more difficult to determine the time of 'awakening' when the data points on the graph of population size against time since naturalisation are so few as is the case with most historical records of invasive plants'. The implications of Cousens and Mortimer's critique are not merely mathematical, however. The issue is whether the theory describes phenomena in the real world. Unless an answer to Cousens and Mortimer can be established, the theory may fail this test.

The issue about the point of inflexion raises what Groves (2006) described as an associated problem, namely that even if more complete data were available, 'the point of inflection at which population increase changes abruptly can usually only be determined retrospectively', so that predictions of weed behaviour are not possible. In other words, we are unable to tell in advance which 'sleeper weeds' will become invasive.

When the history of particular examples of sleeper weeds, such as Oxford ragwort (*Senecio squalidus* L.), is considered it is often difficult to say whether a plant was *asleep* or *awake* at any given point in time. The point at which the population increased its size exponentially is not easy to identify.

The story of the escape of *S. squalidus* from the Oxford Botanic Garden is (with variations) so well known that the plant, although indigenous to Sicily, is often called Oxford ragwort. Baker (1965) described it as 'the most famous example of delayed spread in the British flora.' As such, it is an obvious candidate for the application of sleeper weed theory. But if *S. squalidus* is considered to have been a sleeper weed, it is surprisingly difficult to say when it changed and became invasive.

There is a charming account, attributed by Ridley (1930) to Druce's 'Flora of Oxfordshire', of seeds of *S. squalidus* travelling by train from Oxford to Tilehurst, a distance of about 25 miles. Tilehurst today is on the outskirts of Reading. Ridley described the plant as a native of the volcanic rocks of Sicily and South Italy, and by no means common even there. It was introduced into the Oxford Botanic Gardens in 1699. A century later it grew on more of the Oxford walls (1799), and by 1833 had reached Wytham. When Ridley was an undergraduate at Oxford in 1875, he knew of it growing on walls in a corner of the town. It eventually (1877) reached the railway track. Druce (1927) wrote that:

'The track was made of clinker ash, which suited the plant as much as the lava soil in its home on the Sicilian volcanoes. …I have seen them (the plumed achenes) enter a railway carriage near Oxford and remain suspended in the air till they found an exit at Tilehurst.'

Ridley continued that *S. squalidus* then, travelling by train, reached Reading where 'it is now (c 1930) extremely abundant on the walls of the ruined Abbey and elsewhere'; he traced the spread to various towns and concluded 'This formerly very scarce and local species is now more common in England than anywhere else in the world, and this seems mainly due to the use of clinkers on the railway banks, and the seeds having been blown on to the passing trains.'

Baker (1965) added some later history. 'Its phenomenal spread throughout England has only come about in the last half century, and mostly since the bombings of World War II opened up new habitats for it.' Groves (2006) gave the additional detail that the plant was reported on stonewalls in Oxford in 1792 (Druce 1927) which Groves presumes to be the date of naturalisation. He continued, 'Its subsequent spread was attributable firstly to seed exchange with other gardens, then to the development of a railway network in the late nineteenth century, and then along roadsides as motor transport increased in volume during the twentieth century. The species is now widespread throughout Britain and Ireland.'

In terms of sleeper weed theory, Oxford ragwort was still sleeping when Ridley was an undergraduate in 1875. Was it the coming of the railway which caused it to awaken? Its rate of spread had apparently increased by 1930 when Ridley published. Was it the bombsites created during World War II which caused its spread? Or the post war development of motorways? All these changes in the environment by human disturbance created conditions favourable for its spread. The changes are many years apart. Genetic changes may also have been involved. Baker (1965), following Turrill, raised the possibility of genetic variation between the weedy London populations of *S. squalidus* and the populations growing in the original area of introduction in Oxford. This important aspect has not been fully investigated.

This often considered example is not easy to analyse in terms of the sleeper weed concept. Until a causal explanation of such cases can be provided, there seems little prospect that it could be said with certainty of any plant that it is a sleeper weed which is likely to become invasive in the future.

Grice and Ainsworth (2003) said that, 'The current value of the concept of 'sleeper weeds' lies in raising awareness of the fact that there are many naturalised plants that have not yet become abundant, or widespread, or had a major impact on land use or natural ecosystems. It points to the possibility that there are many potential weeds already naturalised that could one day present major problems.'

But without rigorous scientific investigation to establish criteria for predicting future invasions, such awareness might be better described as a false consciousness. The theory may be more a forensic device than a scientific one. There is a real danger, as the literature demonstrates, that the mere appellation 'sleeper weed' is seen as turning a remote and un-quantified possibility into a perceived known danger.

The notion of sleeper enemy agents embedded in a community who may at some stage engage in hostile acts has been a potent source of fear in society, especially since the terrorist acts of September 11th 2001. Perhaps by reason of its persuasive emotive force, the term sleeper weed continues to have a wide (and often inappropriate) use, despite the lack of scientific studies, in particular for new and emerging weeds which have not become naturalised. As Groves (2006) acknowledged, 'The concept of sleeper weeds has already gained a level of general acceptance (and misuse – see Grice and Ainsworth, 2003) before the science has been done.'

## CONCLUSIONS

The phenomenon of the delayed spread of some weeds presents a challenge to weed science. The possibility that some naturalised species may become serious weeds in the future suggests that investigation leading to a sound basis for prediction of future occurrences would be of great utility.

Unless, however, the scientific basis for the category 'sleeper weed' is established, there may be no justification for its use. While it remains the case that it cannot be known whether there is such a thing as a sleeper weed, the term should be approached with caution. Use to arouse fear of unverifiable danger is illegitimate.

The category 'sleeper weed' invites the application of the principle against unnecessary categories known as Ockham's razor: *entia non sunt multiplicanda* (entities are not to be multiplied).

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