

Review of the Relative Effort Calculator: why the WAP funding model fails western NSW

Draft report - January 2017

Macquarie Valley Weeds Advisory Committee
c/- Orange City Council, PO Box 35, Orange, NSW, 2800
mvwac@orange.nsw.gov.au

The 2014 Natural Resource Commission review into weed management in NSW suggested Weeds Action Program funding be allocated using a risk-based and strategic process. Developed in response by Biosecurity NSW (NSW Department of Primary Industries), the 'Relative Effort Calculator', has been applied to calculate Weeds Action Program 2015-20 (WAP1520) funding for regional projects. Although the model considers weed risk potential and strategic requirements, it lacks scientific rigour and skews funding towards regions with higher population, not necessarily those with higher risk of weed incursions. Many regions have been financially disadvantaged as a result. In particular, local control authorities in western NSW now struggle to deliver basic compliance obligations such as property inspections and surveillance. The relative effort model needs to be reassessed to ensure all regions in NSW have adequate financial provision to undertake core weed management. This reassessment could be undertaken as part of the planned Year 2 review of WAP1520. Amendments should take into consideration the following:

- The 20 percent weighting given to the weed loading component of relative effort calculations is not substantiated and skews results towards regions with higher numbers of small properties and more difficult terrain. The weighting needs to be revised to reflect the true impact of weed loading that is evidence based.
- Metrics used to calculate the weed loading are not reliable
 - Invasive species monitoring data used to calculate historical weed occurrence is incomplete, out of date and is not sufficiently risk-based; manipulation of the data was ad hoc. The data needs complete revision to accurately reflect current weed abundance in each Local Land Service region, or if it is to be used, should only consider priority weeds identified in Regional Strategic Weed Management Plans
 - Weed Futures data used to calculate climate modelling does not accurately reflect risk
 - Pathways and sites considered in vector analysis are not accurately assessed for risk. Known high risk corridors should be given higher weighting, while those with no evidence of risk should not be considered.
- Social factors that impact on a region's capacity to deliver appropriate surveillance have not been considered in the weed loading. Ratepayer income, resident population and current professional weed staffing levels need to be considered.
- Baseline funding through the Weeds Action Program should be provided to each region before the calculation model is applied to ensure each region can be adequately staffed. A review of weed officer salaries should form part of this process.

Introduction

There is no argument of the biosecurity risk that weeds pose to primary industry, the natural environment and society. There is much to lose for all people in NSW from the loss of agricultural production, water quality, aesthetics and biodiversity that weeds can cause. What is not agreed upon is who should pay to protect NSW from the threat of weed spread or from future weed incursions. The landholder, both private and public, has most to gain from controlling weeds on their land. It is their livelihood, and in the case of public land managers, the trust held by those they represent, that is most at stake. Good weed control at a local level also benefits the community and the whole region, not only because any work done by one reduces the risk to all, but also because of the flow-on effect to the local economy. By extension, the whole state benefits from the concerted efforts of one landholder, one community, one region maintaining good weed control. Work done to reduce the risk of weeds entering and/or spreading from one region to another ultimately protects the entire state from that weed. The *Biosecurity Act 2015* reinforces the message that biosecurity is everyone's responsibility but ultimately who shoulders the financial burden?

Low populated areas of NSW are at significant financial disadvantage with respect to weed surveillance and control, and in at least this respect, are at higher risk from weeds. They simply do not have sufficient population, proficient weed staff or resources to maintain adequate surveillance and on-ground work. Western NSW is the prime example; a new invasive weed species could potentially lie unnoticed for years or even decades before being formally identified. With the recent completion of the draft Western Regional Strategic Weed Management Plan, there are concerns that there are insufficient funds to implement key objectives. Weed officers in western NSW take great pride in their role on the front line of weed control but uncertainty over future government funding together with increasing accountability, with no additional support or salary review, has caused widespread discouragement and many are considering leaving the industry. Western NSW needs better resources to fight weeds and empower/educate landholders on their biosecurity responsibilities. Weed officers are encouraged to be more efficient and innovative, and to better engage the community, but with limited staff capability, poor services including mobile phone reception and little IT support, this is challenging. Should the weed burden in the west be solely shouldered by the region or should the people of NSW help cover the cost to keep all in the state safe?

This report evaluates the current funding allocation model for the NSW Weeds Action Program (WAP), as the primary government funding for weed management in NSW. Western Local Land Services region (Western region) is the focus of discussion, but challenges affecting this region apply equally to all of western NSW including the western-most shires of neighbouring North West, Central West, Riverina and Murray LLS regions (Figure 1).

Western Local Land Services Region – constraints to weed management

The Western region is the largest Local Land Services (LLS) region in NSW, covering over 300,000 square kilometres, or 40 per cent of the state. The region takes in three state borders, the nation's largest river system, and is crossed by major trans-national transport routes. Communities in this remote region struggle with boom and bust production cycles related to unreliable and extreme seasonal conditions; low rainfall, low soil fertility, isolation with vast distances between centres, high freight costs, high contract labour costs, few services and little industry. Despite its size, it is the least densely populated region, with just under 43,000 people and has the lowest ratepayer base in the state. The region has fewer eyes on the ground, with a low resident population and low staffing levels of weed professionals able to identify and recognise new species. Only six weed officers are currently employed in the Western region through designated Western WAP1520 funding, none are

full time on weed management; two councils in the region do not employ a designated weed officer. Additional challenges to weed management include lack of specialists, difficulties in attracting and retaining qualified staff, difficult working conditions due to extreme temperatures, vast geographic distances staff are required to travel and manage, long dry spells that limit plant growth and extended wet periods and/or flooding that hinder access, all of which impact work plans. Extreme seasonal conditions such as flooding and/or drought bring extra challenges due to increased risk of new incursions through floodwater and large scale importation of stock feed; decent rainfall can also impact work plans due to rapid plant growth from dormant seed bank.



Figure 1: Western Local Land Services region with local control authority boundaries and neighbouring LLS regions shown. Inset: NSW with Western LLS region highlighted. Map provided by Western LLS.

Weeds Action Program and the Relative Effort Calculator

Implementation of weed management in NSW has been the responsibility of local government since 1906. Local control authorities (LCAs), including local government councils and in the Western LLS region, Department of Industry – Lands – western region (Lands - unincorporated area), are responsible for enforcing weed legislation under the current *Noxious Weeds Act 1993* and the incoming *Biosecurity Act 2015*. The NSW government recognises the benefit of the inspection and enforcement work of LCAs to the state and for the last 50 years have provided financial assistance. This funding became the Weeds Action Program in 2010. The current Weeds Action Program 2015-20 (WAP1520), in addition to state projects, funds 11 regional projects based on LLS boundaries. The Western WAP1520 project is a five year regional project including Western LLS, Macquarie Valley Weeds Advisory Committee (MVWAC) and all but three LCAs in the Western LLS region as partners (Brewarrina Shire, Bourke Shire, Cobar Shire, Central Darling Shire, Balranald Shire, Wentworth Shire and Broken Hill City councils, and Lands - unincorporated area). The remaining three councils in the region receive funding through the Central West WAP1520 project (Bogan Shire) and Riverina

WAP1520 project (Carrathool Shire and Hay Shire), as these councils lie mostly within those LLS regions.

A new risk-based funding process, termed the 'Relative Effort Calculator', was developed and implemented by Biosecurity NSW, Department of Primary Industries (NSW DPI) in 2015 to calculate WAP1520 funding for regional projects. Two years on, the allocation model is now worthy of review. The 2014 NRC review into weed management in NSW highlighted the need for a process to allocate funding and resources across the state, and suggested future WAP funding be allocated using a risk-based and strategic process (NRC Review 2014, Section 3.3). Developed in response, the Relative Effort Calculator addresses the biggest cost of weed management ie labour, particularly in delivering compliance, in the form of property inspections, regarded as the core role of WAP partners (Scott Charlton pers comm.). Based on three main components, the model analyses the comparative 'relative effort' required across NSW and calculates an actual cost for this core activity. The 'property profile' considers the relative difficulty of inspecting properties of different scales and the associated costs of travelling to visit those properties, with travel and time spent 'on-ground' identified as major factors affecting labour cost (Charlton 2016; and Scott Charlton pers comm.). Terrain is also a significant influence on the cost of inspections, and the model compares regional variation. The third component of the model is pathway analysis or 'weed loading', based on historical weed occurrence, climate modelling and abundance of known vectors/ high risk pathways and sites. Weed abundance and/or the prevalence of high risk weeds influences re-visits or time on the ground (Charlton 2016; and Scott Charlton pers comm.). A formula was developed to calculate the relative effort required for each region, based on property profile (p), terrain (t) and weed loading (L).

$$E = (p \times t) + (p \times t) \times \frac{L}{20}$$

Overall, the Relative Effort Calculator, as a 'cost of business' approach has been well thought out. Analysis of size and density of properties, and terrain, is an effective and efficient way to calculate actual time and labour costs required to complete inspections and surveillance in a region. Implementation of the model however, has resulted in a number of regions being financially disadvantaged in the allocation of WAP payments. This has significantly impacted work programs, particularly for agencies who already experience financial hardship, with a cost to on-ground weed control and surveillance (ie market failure). The Western WAP1520 project, for example, received just over \$233, 000 or 2.5 percent of the WAP 2015-16 budget for regional projects, equating to a 20% decrease in annual funds compared with funds received by participating partners in the first WAP round (2010-2015). As a result, staffing levels across the region have dropped to the equivalent of less than six full time weed officers; it is questionable if this number is sufficient for a region covering 40% of NSW. There have not yet been any job losses, but a number of weed staff have had their work load increased with other duties to make up for the funding shortfall, taking them off core weed-related activities. At current funding levels, Western region is not able to provide an adequate biosecurity response, either preventative or reactionary. The model needs to be reassessed to ensure all regions of NSW can deliver basic compliance obligations.

Reassessment of the 'cost of business' model

Interrogation of the Relative Effort Calculator has identified four areas that need reconsideration to ensure all regions in NSW are given adequate financial provision and to avoid market failure. These include 1) the weighting given to the weed loading component when calculating the relative effort of core activities; 2) the reliability of metrics used to calculate the weed loading; 3) consideration of social factors that impact on a regions ability to adequately maintain biosecurity and 4) baseline WAP funding should be provided to each region before the calculation model is applied to ensure

each region can be adequately staffed. These are outlined below, along with suggested amendments to the model.

1. Formula weighting

The formula used to calculate relative effort across the state gives disproportionate weighting to the three components assessed. While property profile and terrain were given equal value, weed load was calculated on an influence of only 20%. It is not clear from internal documents provided by NSW DPI whether this figure was based on the percentage of sites requiring a re-visit or on the assumption that weed abundance only influences re-visits 20% of the time. In either case, it would seem more relevant to look at how weed loading influences all surveillance and inspections, not just re-visits, and how it impacts risk to the region. Any weighting applied should be based on evidence. Weed officers across central and western NSW (ie Central Tablelands, Central West and Western LLS regions) indicate that weed surveillance and inspections are influenced by weed loading 50-80 percent of the time while weed abundance influences revisits 80-100 percent. These figures are supported by new incursion data collected through WAP reporting for the same area. Although this data is limited by the ability of weed officers to recognise new species and their diligence in reporting them, the majority of new species reported occur on high risk pathways or sites. All high risk weeds (current Class 1 or 2 species including parthenium weed, frogbit, alligator weed) found in central and western NSW since 2010 have occurred on or close to high risk pathways or sites (WAP annual reports 2010-2016).

Application of the formula has resulted in WAP1520 funding allocations being skewed towards more populated regions on the coast (North Coast, Hunter, Greater Sydney and South East, Figure 2) as they have large numbers of small properties, and more difficult terrain (ie hillier). Pathway analysis, due to its lower weighting, makes little impact on the funding outcome. This does not seem equitable or fair; the focus of the relative effort model should be not only cost-based but should give greater weight to risk. When weed loading data are compared on their own (Figure 3), Western, North West, Central West and Murray regions, along with South East recorded the top five highest weed loading scores and yet these regions, except for South East which is discussed further below, received the lowest proportion of funding in Year 1 and 2 WAP1520 rounds. From a cost point of view, size and density of properties, and terrain have a significant influence on human resource requirements for compliance activities. As guided by the NRC review, WAP funding allocations should be not only strategic but also risk-based. Weed loading influences not only strategic requirements for on-ground work but is also an indication of the likelihood of new weeds entering a region. The formula needs to be reassessed to take this risk into account when calculating relative effort for core activities. Weed loading should be given greater weighting in the calculation process.

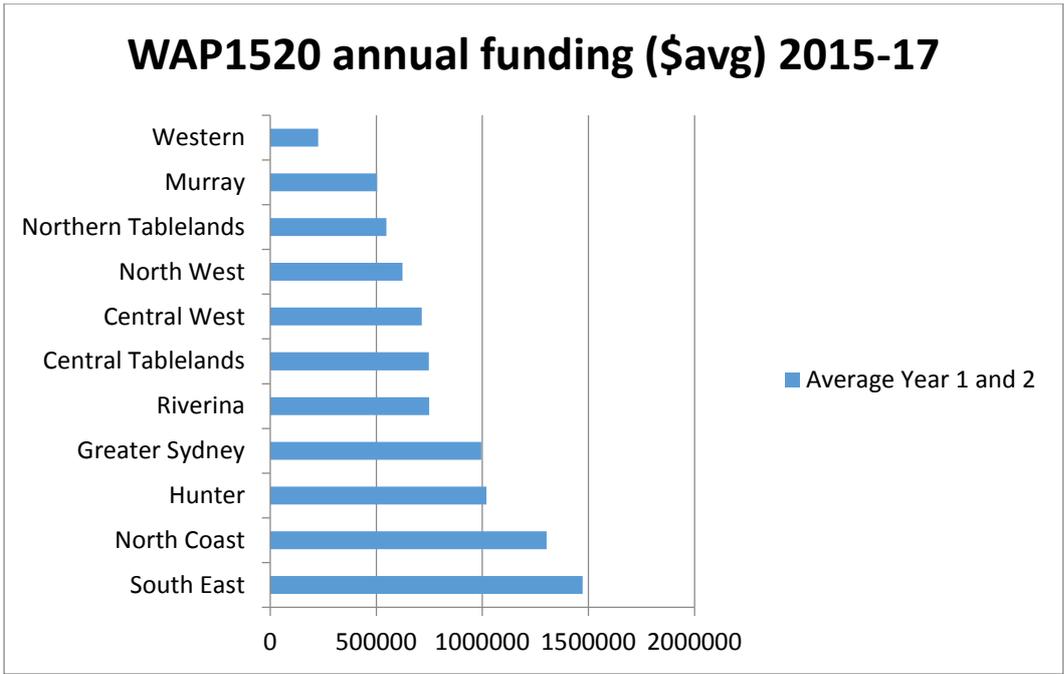


Figure 2: Annual WAP1520 funding for years 1 and 2 (2015-2017, average), (source: DPI extranet)

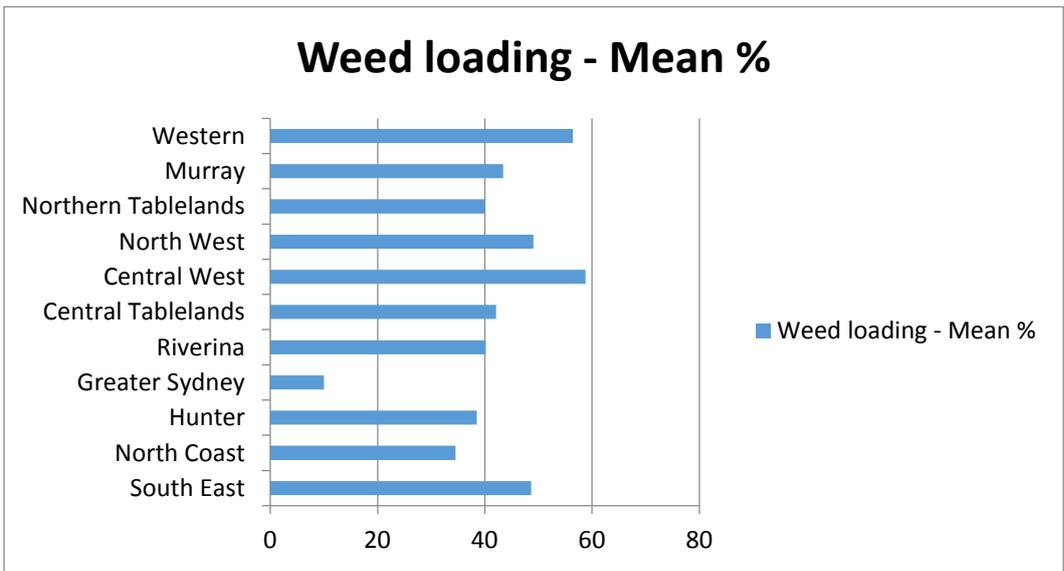


Figure 3: Weed loading score – mean average (data provided by Scott Charlton pers comm.)

2. Metrics reliability

The reliability of metrics used to calculate the ‘weed loading’ component of the relative effort model is also under question, in particular the accuracy and/or relevance of baseline data. Comparative analysis of weed loading scores is presented in Table 1 and Figure 4.

Weed loading

LLS	Central tablelands	Central west	Greater Sydney	Hunter	Murray	North Coast	North West	Northern Tablelands	Riverina	South East	Western
Avg	56	41	52	48	49	47	33	50	49	52.5	43
Weed futures data %	64	47	60	55	56	53	38	58	56	60	49
Invasive species monitoring data %	47.761194	35.0746269	44.776119	41.04478	41.791	39.55224	28.358209	43.28358209	41.79104	44.776119	36.5671642
Rivers %	7.4646703	9.85114481	3.5440964	8.824317	8.26197	8.658249	10.659045	9.461813456	7.074919	13.424573	12.7752062
Roads %	5.55147703	11.6301592	9.9995844	7.10053	7.08673	6.914561	8.6981079	4.949608874	10.00512	10.709367	17.3547534
Animal industries %	6.57355847	10.8270158	14.411092	8.798461	5.68167	3.175445	7.2797442	6.126409333	19.32468	10.693161	7.10876435
Pasture %	6.13822966	16.7475375	0.308522	3.399067	6.55657	2.846368	10.935329	7.40119278	10.00702	8.8374357	26.822726
Cropping/fodder %	2.50319481	27.4610964	0.0970761	0.877492	10.2005	0.468391	27.591483	2.097785682	21.81572	1.0695268	5.81771927
Total	28.2311303	76.5169537	28.360371	28.99987	37.7875	22.06301	65.16371	30.03681012	68.22746	44.734063	69.8791692
Mean %	42.1155651	58.7584769	40.180185	38.49993	43.3937	34.53151	49.081855	40.01840506	58.61373	48.617032	56.4395846

Table 1: Comparison of weed loading factors (Source: Scott Charlton pers comm.)

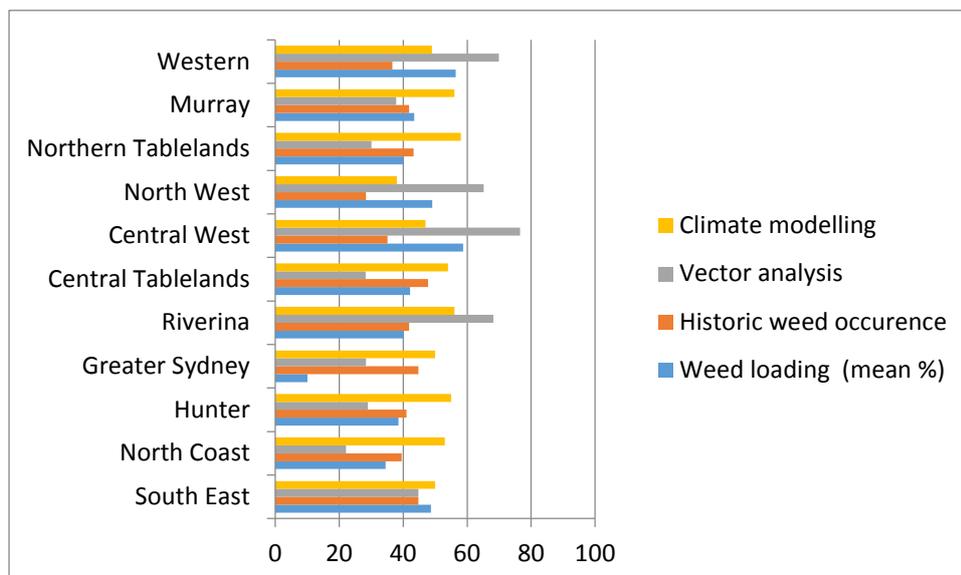


Figure 4: Comparison of factors considered for weed loading calculations, based on numerical figures shown in Table 1

Historical weed occurrence, the first of three factors considered for weed loading, was based on invasive species monitoring data from the NSW local government weeds survey completed in 2007-08 (Brindle 2008, Brindle and Williamson 2010). Survey results present the distribution of 134 priority weeds across the state, based on former Catchment Management Authority boundaries. Reliability of the data source is questionable for a number of reasons. Firstly the data is incomplete. The survey was optional and not all agencies participated, particularly in the western half of NSW, with information gaps presumably being filled by the expert panel. In addition, the survey was completed at a broad scale and lacks sufficient accuracy. Weed occurrence for many species in the report show large areas of the state as occurrence ‘unknown’; recent work by Western Regional Weed Committee has recognised that many of these species are in fact present and established in the region including mesquite, silverleaf nightshade, bridal creeper, mother-of-millions, green cestrum, willows, peppercorn, onion weed, honey locust, lippia, mimosa bush, fleabane, tree of

heaven, noting that most are low risk. Results for a number of species shown as present in the Western region, are incorrect. For example Hudson Pear (*Cylindropuntia rosea*) is shown as an emerging weed throughout Central Darling Shire. No Hudson Pear has been found in that area. The 2008 results reflect not only lack of survey returns but also lack of staff, especially in western NSW, to accurately complete the survey. Conversely, while the increase in weed species present in eastern NSW is to be expected with increasing annual rainfall towards the coast, survey results are potentially skewed by higher numbers of weed staff on the ground undertaking surveillance and higher number of expert weed ecologists with local knowledge residing in these areas.

Secondly, the 2008 report is out of date and does not accurately reflect weed risk to the state. A number of major weeds are not included in the distribution maps including tropical soda apple, fireweed, burr ragweed and African boxthorn. Occurrence of many other species has increased or new incursions discovered since the survey was completed, including those in the western region listed above, as well as orange hawkweed, parthenium, parkinsonia and alligator weed. A new revised survey is well overdue. While distribution and density data is now being collected by WAP partners through the Biosecurity Information System (BIS), an accurate picture of weed burden in NSW will not be available until at least 2021 when the first five year inspection cycle is completed and data uploaded. In the meantime, new incursion data collected through annual WAP reporting could be used as a guide to weed occurrence in the state or new Regional Weed Committees could be tasked with updating survey data.

Thirdly, the relative effort model, as guided by the NRC review, should be risk-based. The 134 weed species prioritised by Brindle (2008) do not all fit current definition of high risk/priority weed and their occurrence is unlikely to influence inspections. If the 2008 data is to be used as a guide to inform future funding allocation, only state prioritised weeds – ie weeds listed as Prohibited Matter (as per Schedule 2 of the *Biosecurity Act 2015*), Biosecurity Zones (as per Part 5 of the draft *Biosecurity Regulation 2016* under the *Biosecurity Act 2015*) and Control Orders (as per *Weed Control Order 2017* under the *Biosecurity Act 2015*) should be considered. Regionally prioritised weeds, as listed in draft Regional Strategic Weed Management Plans, with prevent or eliminate outcomes may also be considered. Despite limitations of the 2008 survey, interpretation of the weed occurrence data indicate that the majority of state prioritised weeds (noting that of these, only nine species currently occur in NSW) and many regionally prioritised weeds occur primarily inland, not on the coast eg parthenium, orobanche, orange hawkweed (based on 2017 distribution), Mexican feather grass, Parkinsonia, Chilean needle grass, blue heliotrope, silverleaf nightshade, prairie ground cherry. Considering the abundance of only these high risk weeds will change weed abundance scores in relative effort calculations.

An additional criticism is the method used to convert the weed abundance data from the 2008 survey, which was recorded in CMA regions, into LLS regions. It is unclear if the translation of the data occurred accurately. The raw data should have been reallocated based on actual geographic location, not done at a regional level, to determine exactly which weeds, as presented in 2008 survey, occur within new LLS boundaries.

Climate modelling, the second of three factors considered for weed loading, was based on weed futures data developed by Macquarie University (<http://weedfutures.net/>). This study used species distribution modelling as the basis for assessing the threat posed by 541 non-native naturalised and invasive plants under current and future climates within Australia. Although an excellent resource, this data is not relevant to relative effort calculations because most of the 541 species considered do not pose a significant risk in NSW and are unlikely to influence an inspection. If the weed futures

data is to be used as a guide to inform future funding allocation, only state prioritised weeds (ie Prohibited Matter, Biosecurity Zones, and Control Orders, as well as weeds listed under Mandatory Measures, as per Division 8 of the draft Biosecurity Regulation 2016 under the *Biosecurity Act 2015*) should be considered, a total of 49 weed species. Note that of these, only 15 have been considered by Weed futures.

Vector analysis, the final factor considered for weed loading, was guided by the study of Sindel et al. (2008) into sources and pathways of weed spread in Australia. Based on survey responses from weed experts, the study ranked the importance of weed sources, with transport sites, land in transition, pastures, gardens and nurseries, and rivers rated most important (Figure 5). All pathways identified were considered to pose a relatively high risk of weed spread. The relative effort model compares the abundance of known sources and pathways for weed distribution including rivers, road networks, livestock movements and fodder production, to determine relative risk in each region to new weed incursions (Table 1). This is a fair approach. The model does not address two of the top sources for weeds – land in transition and the ornamental horticulture trade/private gardens, as identified by Sindel et al. (2008). The first vector would be difficult to quantify and the latter, although it could be estimated based on resident population, would not be useful data as the population of Sydney, at 4.4. million, would skew results (noting population of other regions in the state are much lower: Hunter 670,000, South East 605,000, Central Tablelands 156,000 Central West, Murray and North West approx 110,000, Riverina 60,000 and Western 43,000; statistics sourced from each LLS website).

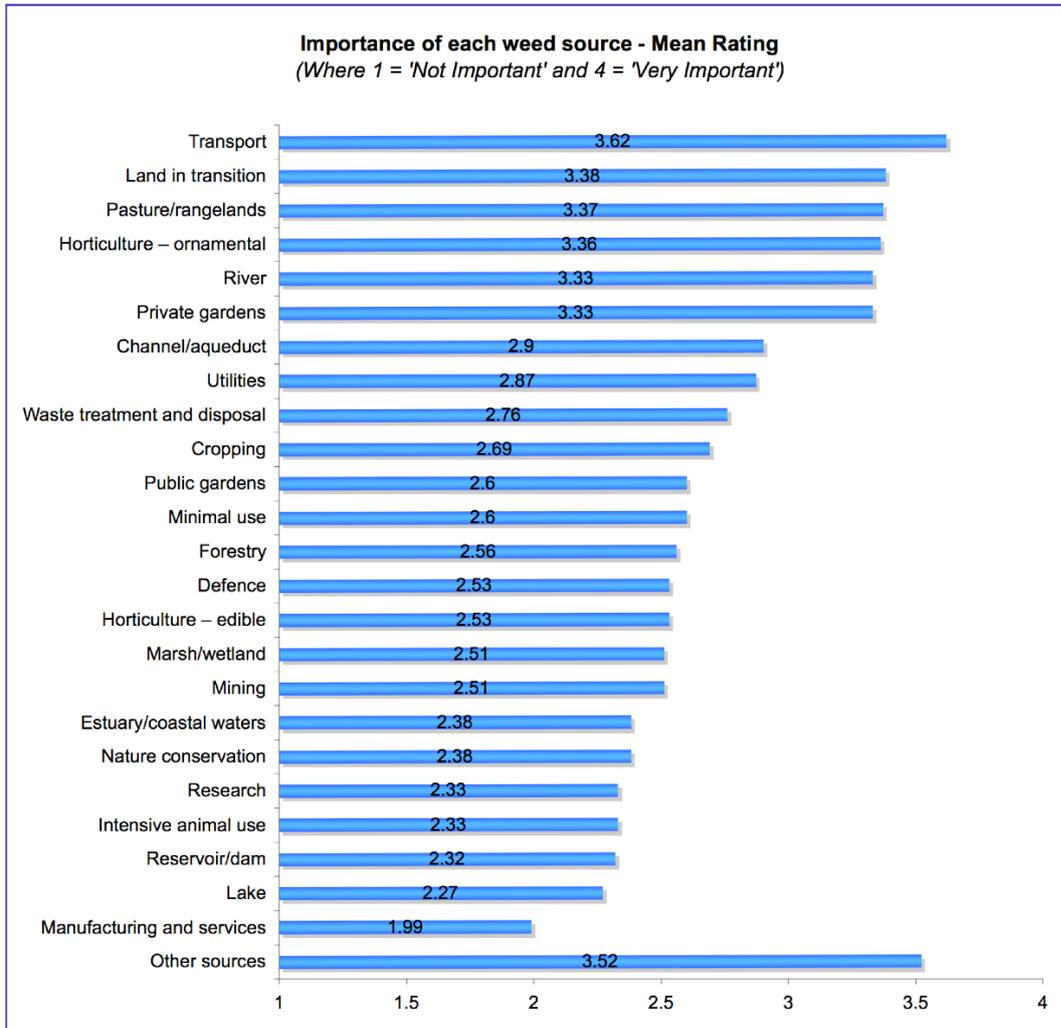


Figure 5: Importance of each weed source (Sindell et al. 2008)

Transport was identified by Sindell et al. (2008) as the most important source of weeds (Figure 5). The relative effort model considered the roads network including only primary and arterial roads, and motorways. This is a fair way to compare risk, but some weighting should be added to known high risk corridors such as the Newell Highway and other major roads entering the state from Queensland, especially those used by agricultural machinery and grain transporters. New incursion data recorded in annual WAP reports (WAP 2010-2016) supports the higher risk of these corridors. Considerable published data also supports the movement of invasive species along high traffic transport routes.

The model considered total length of primary and secondary rivers across the eleven LLS regions. The risk posed by rivers with headwaters within the same region is questionable because any risk of new incursions is contained within the region; future reassessment of the model would be best to leave these rivers out of calculations. South East region for example has the highest percentage of rivers in NSW at 13.4% as per weed loading calculations (Table 1), but all originate within the region (Figure 6). In comparison, rivers in the Western region, which comes in a close second at 12.8% of all rivers in NSW (Table 1), all originate outside the region with headwaters either in Queensland, or in the tablelands or western slopes regions. These rivers have crossed multiple LLS boundaries before reaching Western region and carry a much greater risk of introducing new weeds than any river in the South East region. They should be weighted accordingly.

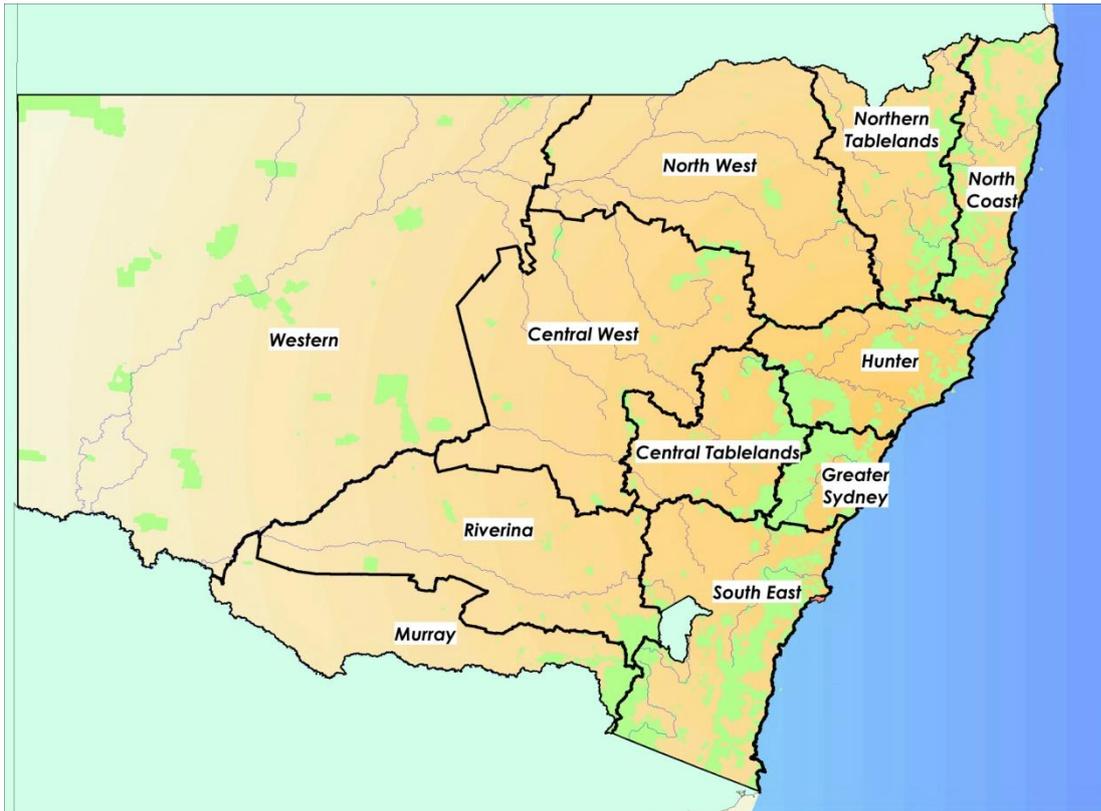


Figure 6 – Major rivers of NSW with LLS boundaries

3. Social factors

The cost of business model addresses the main factors influencing cost of on-ground work and risk of new incursions in a region. But what is not considered in weed loading analysis is the impact social factors have on biosecurity risk and a region’s strategic ability to manage that risk. In particular, population and income. Western region is the least populated region and as a result, has the lowest ratepayer income in the state. These factors put LCAs at a significant disadvantage compared with more populated regions. As discussed earlier, insufficient resources impact on a regions ability to undertake core inspection and surveillance work. Population also makes a significant impact through the often unrecognised role community members play in active and passive surveillance (Cacho et al. 2012); a benefit not available to areas of low population. Low income and low population have a direct impact on long-term cost to on-ground work due to the likelihood that new incursions go unnoticed until they have become well established. The result is not only a cost increase for their control but also the potential for increased impact on agriculture, the environment and human health. Social factors, as an additional aspect of risk and future cost to a region, need to be reconsidered in relative effort calculations. A comparison of available funding and population statistics in the Western region, as the recipient of the smallest WAP allocation, and South East region, recipient of the largest WAP grant, is presented in Table 2.

	Western region	SE region	Proportion Western to SE
WAP allocation 2015-16	\$233,467	\$1,535,148	15%
Percentage of WAP allocation for regional projects 2015-16 (total for state)	2.5 %	16.5%	
Land area	314, 500km ²	56, 994km ²	550%

Council rates income 2015-16 (total for region)	\$39,495,000	\$490,376,000	8%
Total annual council income 2015-16 (total for region)	\$158,933,000	\$980,475,000	16%
Total grant income (for operating purposes)	\$67,852,000	\$117,052,000	58%
Proportion grant income to total income	43%	12%	
LCA expenditure on weed management 2015-16 (total for region)	\$177,345 WAP grant \$278,822 Agency funds	\$1,366,506 WAP grant \$2,380,774 Agency funds	13% 12%
Resident population	42,873	605,000	7%
LCA and LLS on-ground weed officer number (FTE)	<6 LCA	24.3 LCA 12 LLS	16%
Landcare networks (indication of community surveillance)	1	17	

Table 2. Comparison of income and population between Western LLS and South East LLS, as the smallest and largest recipient regions of WAP1520 funding (Sources: DPI extranet, Western and South East LLS websites, local government council annual financial reports as per relevant LLS region (available on council websites; calculations and weblinks provided on request), Western WAP1520 annual report (2015-16), Mary Appleby pers comm., Louise Turner pers comm.)

Income. Annual rate income for local government councils in Western LLS region, in comparison to regions with higher population, is low. With low income capacity, over 40 percent of annual council expenditure is subsidised by state and federal government grants (as calculated from annual financial reports on relevant council websites, weblinks provided on request; Table 2). Councils in the region rely on grants like WAP1520 to maintain weed control programs, but with reduced fund allocation and resulting cutbacks to staff time, they struggle to fulfil WAP requirements. Unlike more populated regions with higher rate-payer base, regional and remote councils have fewer options to source funds and cannot easily increase their own agency spending to employ additional staff. This situation is compounded following extreme seasonal conditions such as flooding or extended drought, due to the increased risk of introduced seed/plant material by flood water and through imported fodder. There is particular concern that current WAP allocation has left Western Region without sufficient resources to mitigate the risk of new weed incursions or address new infestations. Financial capability to resource core weed work should be considered when allocating WAP funding.

Population. The effect of population on weed risk is usually seen in the negative; the higher the population, the higher the risk of new incursions through increased numbers of private gardens, plant nurseries, aquarium suppliers, transport movements and so on. But the converse is also true in that the higher the population, the more 'eyes on the ground' to spot weeds that shouldn't be there. Professional botanists, weed ecologists and agricultural scientists trained in weed surveillance tend to live in more populated centres. Many regions also benefit from weed-active volunteer groups such as Landcare, Dunecare, and bushwalking and field naturalist clubs as well as 'citizen scientists', members of the community with an interest in what weeds grow in their region. A good example of both active and passive surveillance by community members is the current eradication program for hawkweed in Kosciusko National Park. Hundreds of volunteers from the local area and from nearby Canberra have been employed in the program, and the excellent community relations campaign run by the NSW Office of Environment and Heritage has resulted in a number of new infestations being spotted by members of the public, both within the park and on nearby farmland. Real gains have

also been made in improving surveillance and weed control through excellent on-ground community work in South East and North Coast LLS regions including use of Community Based Social Marketing and engaging groups like Green Army and Bushcare.

Remote areas of NSW do not have the benefit of so many eyes on the ground, with sparse population and few specialists or weed-aware community groups. Surveillance, control and community engagement work in Western region falls largely on the six weed officers employed through the Western WAP1520 project, each responsible for areas 30 times larger than coastal regions (Table 2). These dedicated staff struggle to get basic compliance work done, let alone look for innovative ways to do their job better. With these challenges, future community engagement work may be better spent attracting volunteer weed/conservation enthusiasts from outside the region to assist surveillance and control programs, or seeking corporate sponsorship deals or philanthropic donations. In some way, tap into the affection urban populations hold for the iconic outback to assist in its protection from the weed menace. The benefits of such work is likely to be significant for western NSW, for example Cacho et al. (2012) estimated that each dollar spent on community engagement is equivalent to more than \$50 in active surveillance costs for invasive species. The problem for western NSW is that any work done in this area takes scarce staffing resources off core weed duties. Coordination of future resourcing could be a role tasked to the new Regional Weed Committees with assistance from additional WAP1520 funding.

4. Baseline funding

With the lowest population per hectare and lowest income than any other region, WAP1520 funding must ensure that Western region, as well as similar adjoining remote LCAs, have adequate resources to maintain biosecurity. Staffing levels required to complete core weed activities, as calculated by the relative effort model, need to be balanced by each region's actual financial ability to fund it. The current model fails western NSW by not considering the actual capacity of LCAs to deliver basic compliance obligations. If a region does not have sufficient funds to undertake core weed work such as property inspections and surveillance, you can't expect good detection and the risk to agriculture, the environment and human health is heightened. This risk needs to be considered in the allocation of WAP funding. Baseline funding through the Weeds Action Program should be provided to each region before the calculation model is applied to ensure each region can be adequately staffed. In addition, a state-wide review of weed officer salary should be completed to ensure equity across the state. This should take into consideration upgraded responsibilities under the incoming *Biosecurity Act 2015* and WAP1520 reporting especially Biosecurity Information System (BIS) compliance. Current salaries vary from as little as \$38,000 to more than \$60,000 for staff undertaking a similar role.

Conclusion

Local control authorities in NSW acknowledge the financial assistance the state government provides through the Weeds Action Program. The relative effort calculator has improved efficiency in allocating regional WAP funding across the state but it has disadvantaged regions with low population and low income. The current WAP funding model fails western NSW because strategic requirements have outweighed risk and the financial capacity of regions to undertake core weed work has not been considered. The relative effort model needs to be reassessed to ensure that the limited funding available for weed management in NSW is allocated where the risk and needs are greatest.

Acknowledgements

This report was prepared by Lis Arundell, Regional Project Officer. Early drafts benefited from discussions with weed officers in central and western NSW, in particular Don Mackenzie (formerly Bourke Shire), Melissa Gunn (Cobar Shire), Steve Watts (Wentworth Shire), Peter Hutchinson (Brewarrina Shire), and Ema Serevi (formerly Balranald Shire); members of the Western Regional Weed Committee and colleagues from various government departments. Particular thanks to Scott Charlton for making available unpublished data, Mary Appleby for providing information on South East LLS region and South East Weeds Action Program 2015-20 project, and Louise Turner for information on Western Landcare NSW.

References

Biosecurity Act 2015 No 24 <http://www.legislation.nsw.gov.au/acts/2015-24.pdf>

Biosecurity Act 2015 - Regulatory Impact Statement - Proposed Biosecurity Regulation 2016 (draft November 2016)

Biosecurity Act 2015 - Weed Control Order 2017 (yet to be released, refer to Western RSWMP Appendix 1)

Brindle S. 2008. Invasive species monitoring – local government weeds survey (2007-2008). NSW Department of Primary Industries.

Brindle S. and Williamson R. 2010. Assessing the impact of priority invasive species. Monitoring, evaluation & reporting program Technical report series. NSW Department of Industry and Investment http://www.dpi.nsw.gov.au/_data/assets/pdf_file/0004/333427/assessing-the-impact-of-priority-invasive-species-technical-guidelines-2010.pdf

Charlton S. A. 2016. Relative effort calculations as a guide for regional weed investment. Proceedings of the Twentieth Australasian Weeds Conference (2016).

Cacho C., Reeve I., Tramell J., and Hester S. 2012. Valuing community engagement in biosecurity surveillance. ACERA Project No. 1004 B 2d University of New England. http://cebra.unimelb.edu.au/_data/assets/pdf_file/0006/1290516/1004B_OID7_Report.pdf

DPI Extranet <http://www.dpi.nsw.gov.au/biosecurity/weeds>

NRC Review 2014. Weeds – Time to get serious. NSW Natural Resource Commission review of weed management in NSW. Final report and recommendations May 2014.

Sindel B., van der Meulen A., Coleman M., Reeve I. And Moss J. 2008. Pathway risk analysis for weed spread within Australia (UNE61). Implications for policy makers. University of New England

WAP annual report Lachlan Regional Weed Management Project 2010-2011 (unpublished)

WAP annual report Lachlan Regional Weed Management Project 2011-12 (unpublished)

WAP annual report Lachlan Regional Weed Management Project 2012-13 (unpublished)

WAP annual report Lachlan Regional Weed Management Project 2013-14 (unpublished)

WAP annual report Lachlan Regional Weed Management Project 2014-15 (unpublished)

WAP annual report Macquarie Invasive Species Project 2010-2011 (unpublished)

WAP annual report Macquarie Invasive Species Project 2011-2012 (unpublished)

WAP annual report Macquarie Invasive Species Project 2012-13 (unpublished)

WAP annual report Macquarie Invasive Species Project 2013-14 (unpublished)

WAP annual report Macquarie Invasive Species Project 2014-15 (unpublished)

WAP annual report Central Tablelands WAP1520 Project 2015-16 (unpublished)

WAP annual report Central West WAP1520 Project 2015-16 (unpublished)

WAP annual report Western WAP1520 Project 2015-16 (unpublished)

Weed Futures – Determining current and future weed threats in Australia <http://weedfutures.net/>

Western Regional Strategic Weed Management Plan (unpublished draft as at December 2016)