

Detecting new infestations of tropical weed eradication targets

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Summary The National Tropical Weeds Eradication Program (NTWEP) is a long running nationally cost-shared weed eradication program. Delimiting each incursion requires finding and effectively managing all infestations. The NTWEP analyses data on reports, timing, location and methods of detection of new locations. New locations are more likely to be detected by officers employed in a weed-related field or members of the public. Tracing links between locations and specific searches result in fewer new locations but are still important for some of the target weeds. Newer online identification tools and methods may result in a new category of detection events. Understanding, maintaining and enhancing the events that led detections of new locations can build confidence that the extent of each incursion of the five NTWEP target weeds is known.

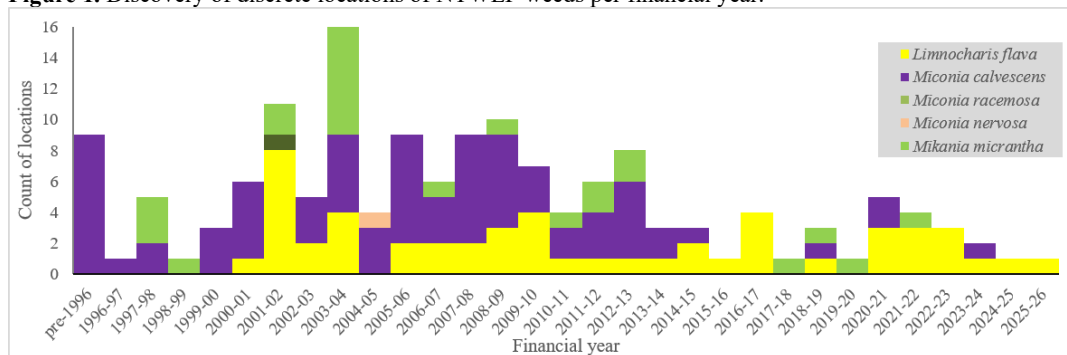
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INTRODUCTION

The National Tropical Weed Eradication Program (NTWEP) targets five weeds for eradication from Australia. These are *Limnocharis flava* (L.) Buchenau, *Miconia calvenscens* DC., *Miconia nervosa* (SM.), *Miconia racemosa* (Aubl.) DC. and *Mikania micrantha* Kunth. Delimiting each incursion means finding and managing all locations of each weed (Brooks and Galway 2008). The program has a national delimitation key performance indicator requiring new locations to be reported to cost-share partners. Similarly, the number of reports received is also a key performance indicator.

Three data sets are collated from NTWEP records. These are; the timing and location of new locations, weed reports received by NTWEP and their outcomes, and the activities that resulted in the detection of new locations. Each data set is described and discussed below with reference to four detection categories (Brooks and Galway 2008), and the ‘surveillance continuum’ (Hester and Cacho 2017).

Figure 1. Discovery of discrete locations of NTWEP weeds per financial year.



DATA SOURCES

Discovery of new locations New locations are defined as a new waypoint that is twice the prescribed dispersal buffer from a known location. This is up to 2 km depending on the target weeds natural dispersal vectors. Locations may be historical, single plants, nursery records, small or large infestations of *M. calvenscens* (Brooks and Erbacher 2022). Locations

may also be previously cultivated, contained, or free flowing infestations of *L. flava* (Brooks *et al.* 2022). Due to the capacity for vegetative and seed reproduction, all *M. micrantha* locations are treated as naturalized infestations (Brooks and Jeffery 2018). Other locations can have one or thousands of plants. The number of locations may decline if plants are found between close infestations and they merge.

Weed Reports The NTWEP maintains a list of 375 reports received from various sources in each financial year from 2008-09 to 2024-25. Each report was sorted into four outcomes; positive at a known infestation, positive at a new location, negative not a target weed and insufficient information to determine the plants' identity and/or location.

Detection categories Information about the discovery of new locations, including weed reports, was used to classify detection events into four categories (Brooks and Galway 2008). The most prominent category were detections by workers who knew about weeds from employment in a weed related field. This includes work activities on other or a range of weeds. Information about new locations has come from the public who have viewed engagement products or made an enquiry about a plant. Some new locations have been found by tracing forward and tracing back information, or botanical garden records. Fewer new infestations were located through specific ground, water or aerial surveys by field crews (Brooks and Galway 2008).

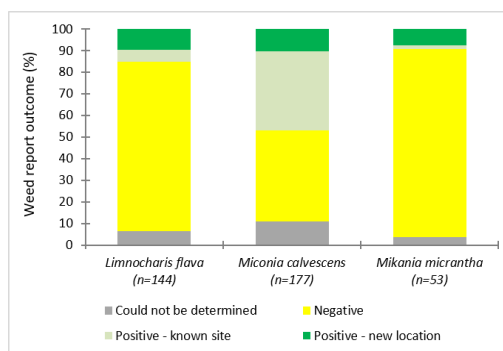
DISCOVERY OF NEW LOCATIONS

The discovery of each location of all NTWEP target weeds to May 2026 is shown in Figure 1. Discovery has broadly declined over the last 10 years. Figure 1 includes historical locations, such as botanical garden specimens known prior to 2003 (Brooks and Galway 2008). Recent *M. calvenscens* locations are in northern New South Wales and the last new north Queensland location was in 2014 (Brooks and Erbacher 2022). Recent discoveries of *L. flava* locations are 'contained' and located outside the wet tropics of north Queensland, in the Northern Territory (Brooks *et al.* 2022) and in New South Wales. They are small, cultivated features and hundreds or thousands of kilometres apart.

REPORTS OF WEEDS DATA

A summary of the four outcomes for the reports of target weeds *L. flava*, *M. calvenscens* and *M. micrantha* are shown in Figure 2. One negative report of *M. racemosa* was not shown, and there were no *M. nervosa* reports.

Figure 2. Outcome of 375 reports for NTWEP target weeds from July 2009 to June 2025.



Reports have been made through Department of Primary Industries call centre, websites, response to social media posts, public events, and local awareness activities for NTWEP surveys. They are primarily reports from the public but can include local and state government officers. Each report is important as reporters have recognized or have some knowledge of the weed and are sufficiently motivated to make the report. It is important that all reports are captured as NTWEP has a key performance indicator for engagement activities generating reports per year.

To minimize inconclusive reports (could not be determined), it is critical to capture sufficient details to enable follow-up contact and for officers to accurately assess the precise location, if a digital photo cannot be provided. Getting an accurate location or contact details can be difficult with reports through comments on social media posts. The data covers major developments in location accuracy, digital photograph resolution and image recognition capabilities of handheld smart devices, which make identification, locating and reporting more reliable.

It is evident in the largest category, negative reports, that accurate key identifying features are critical in engagement products. Not all aquatic plants are *L. flava* and not all large, leafed plants are *M. calvenscens*. The negative reports contain duplicate misidentifications; it is important to capture what the mistaken plant was. For example, *L. flava* has yellow flowers, but the data has multiple reports of aquatic monocots with blue or purple flowers.

The implementation of the Queensland *Biosecurity Act 2014* mandated reporting of some classes of restricted biosecurity matter within 24 hours. Positive reports from known infestations are also encouraging as it illustrates that reporters are aware of the weed and are willing to report it. This assists with delimiting known infestations. Even though it is a known site, reporters have knowledge of the weed that could be applied locations not known to NTWEP.

The weed reports data does not capture all the new locations, but 10% of reports are positive, new

locations and are critical to NTWEP success. These reports are discussed below.

DETECTION CATEGORIES

The events resulting in the discovery of new locations were categorised and are shown in Table 1, as of May 2026. New discrete locations fit the four categories described by Brooks and Galway (2008).

Recognition by weed officers The most common means of detection is by professionals who knew about the weeds via their current or previous employment. Including local, state or federal agencies and maybe looking for another weed or range of weeds or conducting work or recreational activities. Such activities can be broadly classified as general surveillance (Hester and Cacho, 2017). Recognition by professional officers to 2026 was the same percentage of discoveries as it was in 2008 (Table 1). The four most recently discovered *M. micrantha* infestations (Figure 1) were by local government weed officers.

The NTWEP targets single infestations of *M. racemosa* and *M. nervosa*, which were reported as unknown plants while weed officers were investigating other weed occurrences in 2002 and 2004 respectively (Brooks *et al.* 2009). Formal identification was by international experts and shows the importance of reporting unknown plants.

Recent *L. flava* discoveries have been detected by Biosecurity Queensland officers monitoring online platforms to manage biosecurity risks. These discoveries of *L. flava* have been cultivated specimens in central and southeast Queensland, northern and the south coast of New South Wales,

with online information leading to property visits by local weed authorities. The new location detected in 2024-25 (Figure 1), occurred when *L. flava* seedlings were recognized by biosecurity officers and reported to NTWEP. This was while they were inspecting a property identified as a possible source of other biosecurity matter. Workers in weed related fields account for discovering nearly half the new locations. Maintaining awareness of target weeds among professional weed officers in Queensland and interstate is essential for detection and building confidence that each incursion is delimited.

Public information In 2008 and 2026, information from the public was the second most common method of detection (Table 1). *Limnocharis flava* and *M. calvescens* are more likely to be cultivated in domestic situations and there are more public reports in Table 1. These are also more recognizable weeds, particularly *M. calvescens* and the three most recent discoveries (Figure 1) have been through public information in New South Wales. There is also a far higher proportion of reports for known *M. calvescens* locations in Figure 2, which results from delivery of frontline engagement information and surveys near large infestations.

The cultivation of *L. flava* (Brooks *et al.* 2022) means that it is reported by members of the public (Table 1), after viewing engagement products, though 80% of the reports are negative (Figure 2).

It is harder to distinguish *M. micrantha* from many other tropical vines and it has a lot of negative reports (Figure 2). There was one public report if it was invading a backyard (Brooks and Galway 2009).

Table 1. Detection events categorised for new locations of each NTWEP weed to April 2026 and the % in each category in 2008 and 2026. Both 2008 and 2026 counts include single infestations of *Miconia nervosa* and *Miconia racemosa* recognized by weed officers in 2002 and 2004 respectively.

Weed	Recognition by weed officers	Public information	Tracing information	Specific search	Total
<i>Limnocharis flava</i>	27	18	7		52
<i>Miconia calvescens</i>	34	33	7		74
<i>Mikania micrantha</i>	9	1	3	11	24
Total	72	52	17	11	152
2026 (%)	47.4	34.2	11.2	7.2	
2008 (%)	47.9	24.7	19.2	8.2	73*

* 2008 data from Brooks and Galway (2008) and includes an infestation of *Miconia crenata* (Vahl) Michelang. (syn. *Clidemia hirta*) but this weed is no longer part of NTWEP.

Tracing There were no changes in the detections by tracing described by Brooks and Galway (2008) between 2003 and 2021. A desiccated specimen was seized from a property in Brisbane after a package

was traced from a *L. flava* location in Townsville. Also in 2021, two contained features in the Northern Territory were traced after a quarantine officer noticed *L. flava* for sale in a Darwin market (Brooks *et al.* 2022). These three cases raised the % allocated

to tracing detection between 2008 and 2026 (Table 1) and this standard biosecurity response activity still leads to the discovery of new locations.

Search In 2008 the only cases of specific searching leading to detections are *M. micrantha*. Another five infestations were added along creeks in the Mission Beach area to 2024-25 (Table 1). This reflects local wind and/or water dispersal along creek systems.

Specific searches readily generate detection effort data but this form of active surveillance (Hester and Cacho 2017) only accounts for 7.2% of location detections. Under the 2024-2028 NTWEP National Response Plan there are plans to document allied search effort from program stakeholders conducting field activities beyond known infestations.

On-ground survey is the main process for finding weeds after a location is known about and is managed by NTWEP. Remote detection technologies (such as aerial platforms and eDNA) are being developed for the target weeds at multiple locations. However, these also apply around known locations and not to the wider detection of new locations (Brooks *et al.* 2022, Brooks and Erbacher 2022).

ELECTRONIC DETECTION

There are several *L. flava* locations which have been identified through publicly available information shared on online marketplaces (e.g. Brooks *et al.* 2022). There are continued developments in the capacity to investigate the possible cultivation or sale of restricted or prohibited biosecurity matter, such as *L. flava*.

Internet portals such as the Atlas of Living Australia enable citizen science or public (passive) reporting to be consolidated with herbarium records, research grade iNaturalist records and other online sources. Online plant mapping and alert services provide important detection tools towards the passive end of the surveillance continuum (Hester and Cacho 2017).

The original four detection categories (Brooks and Galway 2009) still fit the detection data to 2026. However, several advances in detection and online identification technologies may result in 'electronic detection' becoming an additional category for the discovery of new locations.

PROGRAM ACTIVITIES AND REPORTING

The scope of the NTWEP current stakeholder and engagement plan (2024-28) includes supporting NTWEP surveillance, treatment and compliance activities. This plan identifies internal and external stakeholders locally and nationally, reached via many online and in-person channels with tailored products.

The plan identifies many activities and stakeholders over the surveillance continuum. While recognizing there have been recent moves away from traditional media and fewer opportunities for in person displays of live plants. Under the engagement plan, NTWEP records the products and events or outputs and reach of engagement activities. The program has annual key performance indicators related to the number of reports received and stakeholder awareness and contributed days. These activities and metrics support local and national delimiting efforts, particularly amongst officers in weed related employment and members of the public.

While specific searches generate measurable areas and work effort, the other detection categories do not readily yield detection effort or absence data for NTWEP. Between the engagement outputs and reports received (Figure 1, Table 1) there is a large gap in detection effort which is difficult to quantify. However, maintaining, repeating and rotating diverse engagement outputs will assist in maintaining the detection effort amongst a more transient public and allied work force.

SUMMARY

Post-border invasive species surveillance operates over a continuum of methods from active to general surveillance, and to passive public reporting (Hester and Cacho 2017). With small, rare and disparate occurrences of NTWEP target weeds, the likelihood that they will be encountered is low. Stakeholders such as weed professionals or members of the public are crucial and need to be aware of the targets to recognize and report them if encountered. As new locations decline there is still a need to maintain the capacity to detect any unmanaged locations. This capacity lies amongst NTWEP stakeholders and relies on a range of engagement tools, serving to accrue confidence that the extent of each incursion is known. Tracing activities and specific searches still make important contributions to finding all the locations and need to be maintained. While the potential for electronic detection methods continue to develop.

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