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Guidelines for General Surveillance Programs

INSIGHTS AND CONSIDERATIONS FROM SYSTEMS THINKING AND NINE CASE STUDIES

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Executive Summary

Surveillance is an important part of the biosecurity system. It helps us detect new pests, weeds and diseases and understand how existing ones spread. It also helps us access important markets by providing evidence that we are free of certain exotic pests, weeds and diseases.

Active or specific surveillance activities are undertaken by allocated staff following robust procedures. As it tends to be resource intensive, active surveillance does not usually meet all of our surveillance needs. It is increasingly complemented by programs that involve people from all walks of life participating in gathering and reporting information about the presence of pests, weeds and diseases. These programs are called general surveillance programs and have potential to broaden surveillance coverage and/or achieve more cost-effective biosecurity outcomes. However, general surveillance programs can be difficult to start and maintain.

The General Surveillance Program Guidelines (the Guidelines) have been developed to help program coordinators, policy-makers, funders and those who evaluate and monitor general surveillance programs to understand the key considerations for implementing such programs. It is relevant to all biosecurity sectors (plant, animal, marine, weed and the environment). The Guidelines are based on systems thinking and the lessons learned from nine case studies. The Guidelines have been refined with feedback from about 140 people who work on different parts of general surveillance programs.

General surveillance programs are complex with various interacting parts, including:

- scientific understanding of the target pests, weeds and/or diseases – so the surveillance program is designed based on their characteristics and environments
- effective engagement of people who do the monitoring and reporting (i.e. notifiers) to get accurate, timely and complete reports – reliance on awareness-raising is usually not enough. It requires working with notifiers' motivations, barriers and expectations; providing support; ensuring a positive reporting experience; and maintaining duty of care towards them (e.g. privacy, confidentiality, OH&S and managing liability)
- well-designed tools to make reports – that meet the needs of notifiers and those dealing with the incoming reports
- arrangements to accurately and rapidly identify pests and weeds, or diagnose disease and, if applicable, respond to detections – including investing in cost-effective technologies; managing workloads of lab or herbarium teams; and ensuring quality samples/specimens reach them in time
- data management – including ensuring the way data is collected is fit for purpose; and having efficient and cost-effective processes in place to maintain, share, analyse and use data.

The success of general surveillance programs can be facilitated or hindered by the broader context in which they operate, including through rules and regulations, existing relationships and networks between stakeholders, the capacity and capability in the broader biosecurity system, and available investment.

Systems thinking helped understand how weaknesses or changes in one part of a general surveillance program may affect performance elsewhere. Examples include:

- a lack of notifier support can result in false or incomplete reports being made, which may overwhelm the identification/diagnostic team and/or cause much need for follow-up with notifiers
- too onerous reporting processes tend to deter notifiers from reporting
- poorly designed apps and forms can increase staff time needed to clean and reformat data
- too much time spent on data cleaning/formatting means less time available for data analysis and may limit the value gained from data
- lack of understanding of the target species/diseases can lead to poor instructions to notifiers, e.g. about when, where and what to look for. This may mean notifiers don't have a good experience with the program and discourage their future support.

Instigating and maintaining general surveillance programs require strong on-going leadership, effective program management and adequate long-term resourcing (people and funding).

General surveillance programs requires an effective program coordinator who is ideally supported by a team. Their role include:

- driving the program
- building networks and maintaining effective engagement with notifiers and others throughout the program
- facilitating information flow throughout the program through building trust, ample and timely consultation and working with knowledge brokers
- combining the wide range of knowledge to deliver nuanced understanding about how a program is best designed and maintained to be practical, cost-effective, and sustainable
- communicating program successes and impacts to stakeholders to maintain their support
- monitoring progress to achieve continual improvement by being responsive to issues and opportunities, understanding feedback loops throughout the system, and identifying and capitalising on leverage points.

The benefits of ensuring that general surveillance programs work well and are sustainable can be substantial. Most general surveillance programs deliver more benefits than data only, including strengthening shared responsibility and partnerships for biosecurity; and building trust relationships and networks that are valuable for future activities, including on-ground support during emergency responses.

Contents

1 Introduction

- Australia and New Zealand have developed world-renowned biosecurity systems in response to the threat that biological invasions pose to agriculture, biodiversity, society and the economy.
- However, biosecurity risks are increasing as a result of expanding trade volumes, increasing population, growing traveller numbers and climate change.
- Surveillance is a vital component of biosecurity and it involves collecting, recording and analysing data about the presence or prevalence of pests, weeds or diseases and using the data to inform action.
- Often allocated staff carry out surveillance activities following scientifically robust procedures. This is called active or specific surveillance. However, active surveillance is unlikely to meet all surveillance needs and there is increasing interest in engaging others to assist with surveillance tasks, called general surveillance.

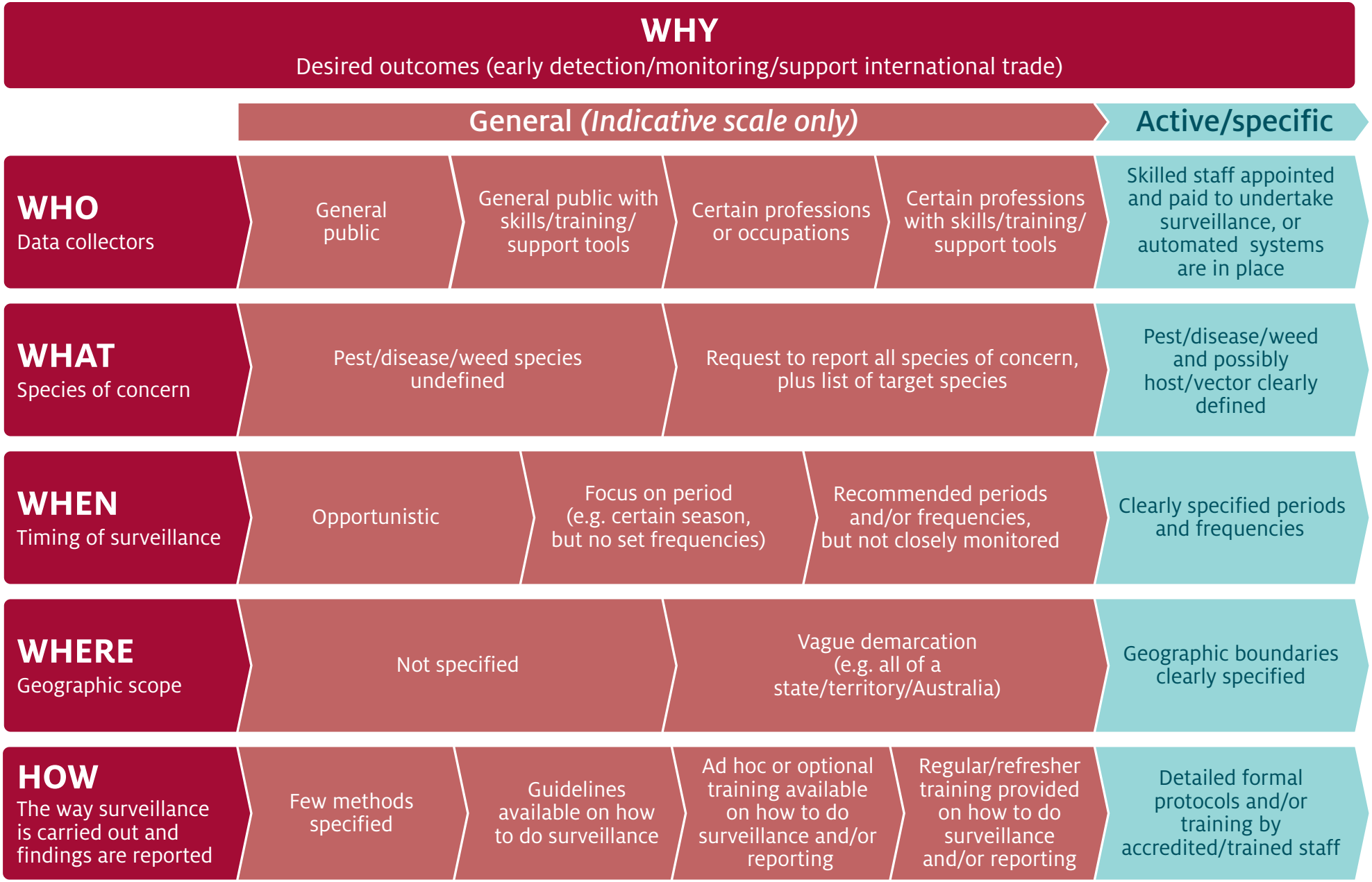
1.1 What are general surveillance programs?

- The definition of general surveillance varies between sectors and is sometimes referred to as passive surveillance. For the purpose of this document, general surveillance programs involve people from all walks of life gathering and reporting information about the presence of pests, weeds and diseases in a way that is fit for purpose. General surveillance activities usually involve elements of opportunism to broaden the coverage of surveillance and/or achieve more cost-effective biosecurity outcomes.
- General surveillance programs range from unstructured fortuitous ad hoc detections to relatively highly structured and carefully planned activities, but excluding active surveillance (see Figure 1). The opportunistic aspect of general surveillance programs can relate to who is doing surveillance; what is being monitored; and when, where and/or how activities are undertaken.

1.1.1 What are data collected through general surveillance programs used for?

- General surveillance program data are used for a wide range of purposes, such as:
  - producing evidence of freedom from important pests or diseases to support trade
  - enabling the early detection of pests, weeds and diseases of concern that maximises the feasibility of eradication or containment
  - monitoring prevalence and trends, such as syndromic surveillance in livestock that gathers information about a range of symptoms that can indicate a change of health in a population
  - increasing understanding of the current and likely spread of pests, weeds and diseases by providing data to state/territory and national databases that monitor spread; and modelling of future spread
  - improving epidemiological understanding of diseases, infections and infestations
  - early warning for farmers, community groups, vets and local governments to know what pests, weeds or diseases are approaching
  - informing program evaluation, such as to assist in targeting future activity
  - other benefits, such as delivering biodiversity data.

FIGURE 1: The general surveillance program continuum with indicative subdivisions



1.2 The Guidelines

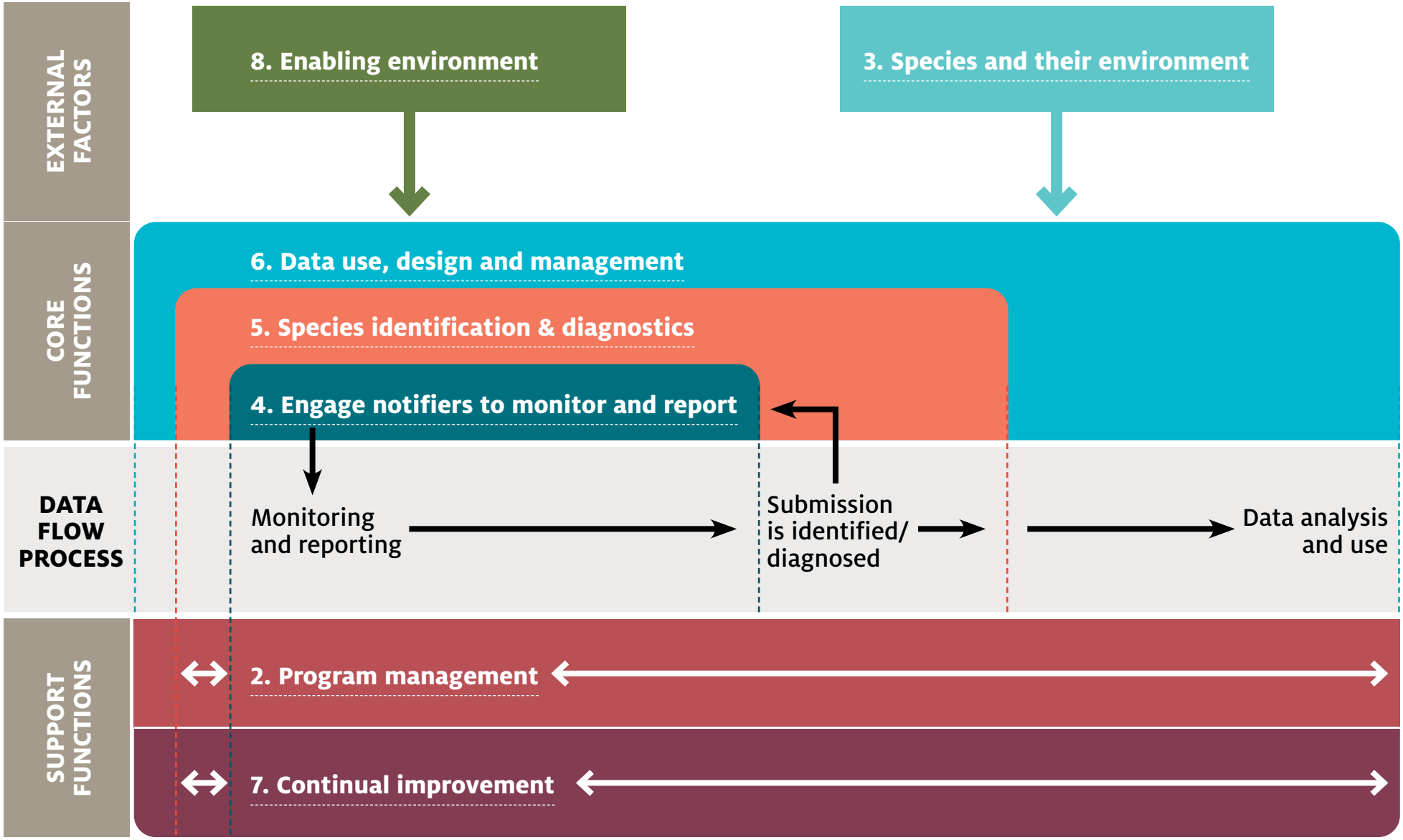
- The General Surveillance Program Guidelines (the Guidelines) provide high level key considerations for program coordinators, funders, policy-makers and evaluators of general surveillance programs, including practical insights into how to make these programs work.
- The Guidelines provide a bird's eye view of the main parts of general surveillance programs and some of the key interactions between them, rather than in-depth guidance on any particular part.
- The Guidelines provide considerations for all stages of invasion, including early detection of exotic, new and emerging species through to monitoring established species.
- The Guidelines are a resource only and do not replace any other guidelines, procedures or code of practices.
- People new to general surveillance programs will benefit from reading the document from cover to cover, while the structure and table of contents allow others to readily find information for a specific part of a program.
- General surveillance programs are diverse so everything here may not be applicable to all programs. Also, this document may not contain everything to consider for a specific program. The intent is to highlight common lessons that were found in multiple diverse case studies and the literature.
- The content of the Guidelines is not in any particular order. Most general surveillance programs develop and evolve through iterative processes, often through learning by doing and adjusting to the needs of the program and its key stakeholders. Most of the Guidelines assist in navigating the evolutionary process.
- Figure 2 provides an overview of how the chapters relate to the data flow of most general surveillance programs. Data are generated through the monitoring and reporting of suspected detections (chapter 4), then submitted for identification or diagnosis (chapter 5) after which data are often analysed and used (chapter 6) for various purposes. Two functions support the entire data flow process, i.e. program management (chapter 2) and continual improvement (chapter 7). General surveillance programs need to operate within the context of external factors, i.e. the characteristics of species and their environment (chapter 3) and the broader operating environment (chapter 8).
- The definition of general surveillance and some related terminology varies between sectors. Terms are used consistently throughout this document but their use may differ to what some readers are used to.
- In this document people undertaking monitoring and reporting of pests, weeds and diseases are referred to as notifiers.

The Making General Surveillance Work project

The Guidelines are the key output of the Making General Surveillance Work project. This project used systems thinking to deepen understanding about what facilitates and hinders success in general surveillance programs. Like other systems, general surveillance programs involve various parts that interact with each other and the broader environment. Systems are dynamic, and weaknesses or changes in one part can trigger cost (time, effort and/or expenditure) elsewhere that could be easily overlooked.

In addition, the project brings together lessons learned from across sectors (plant, animal, weed, marine and environmental biosecurity) based on literature and the lived experience of the people involved in nine case studies of general surveillance programs.

FIGURE 2: An overview of the chapters and how they relate to the data flow process



1.3 Research approach

- The case study research for each case involved:
  - a desktop review of available written material
  - interviews with key informants representing the various functions of the program
  - analysis of interview findings
  - focus group with different representatives of various program functions to verify the interview findings.
- An online survey was undertaken in five case studies to capture notifiers' views.
- Several people with extensive experience beyond the case studies were interviewed to verify findings, fill gaps and broaden perspectives.
- In total the research activities totaled 93 interviews; 8 focus groups; 5 notifier surveys.
- Focus groups and a workshop involving a total of around 140 experts—relating to all general surveillance program parts and representing all biosecurity sectors—reviewed earlier drafts of the Guidelines. Their feedback was used to make refinements.

The case studies

FishWatch South Australia
FishWatch provides an 'one-stop-shop' for the general public, commercial fishers and professionals (e.g. airport customs staff and police) to access information and report potential marine pest sightings or suspect fishing activities. Reports are made to the Department of Primary Industries and Regions, South Australia (PIRSA) experts via the Fishwatch SA hotline. Fishcare volunteers are a key component of the program. Fishcare volunteers provide face-to-face support to fishers and the general public at key fishing locations across the state.

Indigenous community engagement about surveillance
This case study focused on effective engagement with Indigenous communities about general surveillance. It differs from the others in that it does not relate to a specific program. A range of people who have engaged with Indigenous communities about general surveillance were interviewed. Most interviewees had a connection with the Northern Australia Quarantine Strategy (NAQS) and/or the Indigenous Ranger Program of the National Indigenous Australian Agency.

MyPestGuide – Pantry Blitz
Members of the public place sticky traps with a Khapra beetle lure combined with a generalist lure in their pantries. They make weekly reports for one month by submitting photos through the MyPestGuide™ Reporter app (MPG-RA). The Department of Primary Industries and Regional Development, Western Australia (DPIRD) developed the app. The data collected can provide supporting evidence of pest freedom if trading partners enquire about the status of Khapra beetle in Western Australia.

Northern Australia Biosecurity Surveillance Network (NABSnet)
This program utilises the coverage, expertise and goodwill of private vets working in northern Australia to improve animal pest and disease surveillance. It provides private vets with training, resources and subsidies to do thorough significant disease investigations. The program offers networking opportunities between private vets and people in the government biosecurity sector (particularly government vets and laboratory staff).

New Zealand General Surveillance Program – Plant health component

This is a hotline-based system that allows all New Zealanders to report suspected sightings of pests, weeds and diseases. The program targets engagement to groups that have the motivation, capability, and access to report pests, weeds and diseases. It is funded by the New Zealand Ministry for Primary Industries (MPI).

Rural Practitioner Enhanced Disease Surveillance, South Australia

PIRSA provides subsidies to private vets to do investigations into livestock diseases involving laboratory tests to rule out notifiable diseases and where an infectious agent is a potential cause. Five PIRSA vets are appointed to oversee certain livestock species and certain regions. They build trust relationships with private vets to encourage and support them in their participation. The program assists PIRSA to provide proof of freedom from certain diseases to international markets and to detect exotic or newly emerging diseases as early as possible.

State Wide Array Surveillance Program (SWASP)

Most Port Authorities and Industry Ports (referred to as ports) in Western Australia deploy and retrieve settlement arrays, sets of plates submerged in the marine environment on which the larvae of marine organisms and marine algae can settle. Arrays are placed in optimal locations around the ports in summer and winter each year. DPIRD administers the program and delivers support to the ports, including equipment, technical knowledge and sample analysis and interpretation. eDNA technology contributes to species identification.

Weed Spotters Network Queensland

This citizen science program detects and identifies new incidents of state restricted and prohibited weeds early so that preventative measures can be taken. The Queensland Herbarium and Biosecurity Queensland co-fund the program and support it in various ways. Weed spotters are provided with training and a handbook to guide them in their weed spotting activities. Volunteer regional coordinators provide support to weed spotters and promote the program in their regions. Weed spotters submit a specimen to the Herbarium or send in photos via email or the Weed Spotter App to make a notification of sightings.

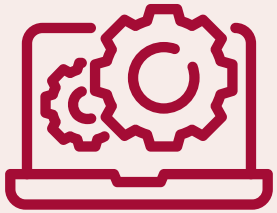
Weed Spotters Victoria

Agriculture Victoria coordinates the targeted recruitment and training of volunteers with the necessary skills, opportunity and motivation to report when they see any of 8 to 12 state prohibited weeds. Monitoring and evaluation ensure a desirable state-wide coverage of weed spotters. Agriculture Victoria funds and administers the program and undertakes most of the species identification through photo submissions, species descriptions and field visits.

2 Program management

Key points

- Appoint a program coordinator (or team) to ensure clear ownership of the program.
- Reduce risk by having more than one person with in-depth involvement in managing the program to share the load, bounce off ideas and maintain momentum if someone leaves.
- Secure sufficient resourcing. Continually demonstrate worth to maintain financial and stakeholder support.
- To initiate a new general surveillance program, consider starting with a pilot and/or tap into existing networks.
- Do not underestimate the investment needed to ensure general surveillance programs dovetail with their prevailing policy, operational and social environment.
- Integrate knowledge from various sources to ensure general surveillance programs are fit for purpose, practical, well-supported and sustainable. Knowledge brokers can be helpful with knowledge integration.
- Define roles and responsibilities clearly to ensure no tasks get overlooked, to enable quick responses to suspected detections and to minimise the impact of staff changes.



- Consider establishing connections between people fulfilling the same function as it can deliver benefits such as mutual support and greater consistency in how tasks are performed.
- Consider establishing connections between people fulfilling different functions throughout a program as it can assist with establishing trust, information flow and self-organisation.
- Look out for opportunities to develop networks with external stakeholders, such as local governments, other government agencies, scientific organisations and industry bodies as it can deliver a range of benefits.

2.1 Introduction

Successful programs need good program management and adequate funding. This chapter contains considerations for both the start of a general surveillance program as well as over time as a program evolves.

2.2 Ensure effective program management

- Appoint the right people to ensure good program management, including a dedicated coordinator and/or a small team to oversee the program as a whole.
- Ensure multiple people work on the program so staff can bounce ideas off each other, share high workloads and ensure continuity if someone leaves.
- However, ensure there is dedicated ownership and accountability if the responsibility of a program sits with a team that have many other responsibilities to ensure the program remains responsive.
- Consider how networks and relationships with key stakeholders will be maintained in case of high staff turnover.
- A steering group can be helpful with problem solving and building connections. Considerations include the required mix of skills (e.g. scientific, policy, IT, communication, engagement, etc.), the level of decision-making powers needed, and the level of understanding of the day-to-day practicalities that would be valuable. Having members of target groups involved ensures their views are represented.
- Ensure the steering group is brought along on the journey and understands the program objectives and challenges to maximise their support.

Enablers

- Effective program planning and coordination require experience and access to a wide skill set, such as related to the biology of the species involved; technology (e.g. relating to apps and identification/diagnostics); data management; and notifier and stakeholder engagement.

Challenges and barriers

- The time and effort needed for effective program administration can be easily underestimated.
- Getting all who need to contribute to the program engaged in a timely fashion can be difficult.
- Dealing with stakeholder and community expectations can be a balancing act, for example, successful programs are often under pressure to increase their scope.

2.3 Define the objectives and scope

- Define the objectives of a program, based on what the desired outcome(s) are (what does success look like?). The objectives may be drawn from legislation, market access requirements or biosecurity processes for a particular jurisdiction. The objectives may change over time as the program evolves.
- Set the scope for the program, including its geographical boundaries and the target pests, weeds and diseases (or their hosts or vectors).
- The objective, scope and available resources informs the approach to sampling, which is discussed in 6.3.
- Embedding the program scope within legislation and government reporting requirements makes it easier to attract government funding.
- If needed, develop a decision matrix to support the choice of pests, weeds or diseases that the program will focus on, such as based on threat and/or impact.
- It is often beneficial to focus on a limited number of pests, weeds and/or diseases as it facilitates:
  - concentrating on those that will deliver the greatest return on investment
  - greater confidence in notifiers being able to identify the pests, weeds or diseases of concern
  - targeted messaging.

  This may depend on the identification tools used, as technologies such as eDNA allow for identifying many species in one sample.
- Programs with a broad scope, such as hotlines for reporting unusual sightings or symptoms, can run campaigns on pests, weeds and diseases of key concern.

What do good program coordinators look like?

They have good soft skills, such as strong interpersonal abilities, including with different groups; good communicators and network builders; instil trust; approachable; passionate; a champion for the cause; and helpful.

They also have strong program management skills, such as being strategic; good at short and long term planning; responsive to issues and opportunities as they arise; committed to continual improvement; a good understanding of the subject; and ability to drive the program.

Continuity in the person appointed is key to facilitate trust relationships.

- Manage resistance against limiting the species scope, remind people of the targeted approach's benefits, and don't completely exclude all other unusual finds.
- Some general surveillance programs balance the species scope with notifier participation as long as it is fit for purpose. There is little point in having a program that is scientifically highly rigorous, but that no one supports.
  - Some programs may not detect all species of concern, but the chosen scope is manageable and supports notifier participation.
  - Some programs include more species in their scope to include species that are of interest to notifiers, because a focus on, for example, exotic or new and emerging species only may fail to keep them engaged.

2.4 Secure sufficient resourcing

- Don't underestimate the resources required to maintain general surveillance programs, including in-kind contributions from interested parties and finances to spend on operations and salaries. Some aspects may be delivered at low cost, but others will require considerable funding.

2.4.1 Sources of resourcing

- Resourcing can be sought from:
  - federal, state, and local governments
  - grants
  - industry bodies
  - other non-government organisations (NGOs)
  - business
  - levies
  - community groups and the wider community can provide a valuable source of in-kind contribution if engaged appropriately (see 4 and 4.2.1).
- If funding comes from more than one organisation, allow time and resources for collaboration and negotiation on an appropriate funding model.
- Consider reducing the demand on resources by `piggy-backing' on other programs (e.g. existing hotlines for compliance reporting).

2.4.2 Securing and maintaining resourcing

- Start a program on a small scale (e.g. pilot program) to require less upfront funding and resources.
- Demonstrate the worth of a program to secure support from key stakeholders and ongoing/long-term funding to enable greater planning, adaptation and coverage of surveillance activities.
- Consider the funding source (see 2.4.1) and the purpose of the program (see 2.3) when choosing strategies to demonstrate worth. Some strategies include:
  - highlight the risk if a notification wasn't made (i.e. consider surveillance as an insurance against incursion)
  - estimate direct (e.g. production and/or environmental) and indirect (e.g. agricultural trade) financial costs from examples of similar species or overseas experience, and be transparent about assumptions
  - demonstrate how the program helps to meet the requirements of biosecurity legislation or organisations' strategic plans
  - use a pilot study to generate data to demonstrate worth
  - highlight outcomes with annual statistics related to notifications, growth in memberships, training numbers, or number of reads and hits on websites
  - highlight the additional benefits that general surveillance programs deliver (see 2.4.4).

- If subjected to short-term, reduced or periodic funding:
  - consider the implications on people throughout the program and clearly communicate the situation to them
  - maintain the engagement with, and trust of, notifiers (see 4.4). Remember to communicate if expectations following a notification has changed (i.e. time to receive feedback). It is easier to openly manage reduced engagement than regaining trust in a stop-start program.

2.4.3 Resourcing checklist

- Consider what functions and operational costs need resourcing from the list in Table 1. Remember key functions may be funded or resourced with in-kind contributions, depending on the program and its context.
- Program administration, internal and external stakeholder engagement, capacity building and data management are best supported by paid staff to ensure continuity and strong accountability for these vital tasks.
- Often a lead government organisation funds and implements the program administration, but this role can also be fulfilled by natural resource management/environmental and community groups. Some parts (e.g. stakeholder engagement) can be outsourced to, for example, consultancy businesses.
- Allocate resources (mainly time and money) to monitor, evaluate and adapt the program. Allow for flexibility to try new things to enable continual improvement (see Chapter 7).

2.4.4 Understand the cost-effectiveness of a program

- Some costs associated with parts of general surveillance programs tend to be higher than for active surveillance, such as those associated with:
  - effective notifier and stakeholder engagement
  - development and maintenance of reporting tools (e.g. apps)
  - intellectual property
  - OH&S and liability issues
  - data cleaning.
- Identify and include the intangible benefits that a program produces when detailing program benefits, such as delivering:
  - networks to draw upon, e.g. for other surveillance activities
  - a more educated and engaged community who are better equipped to take up their shared responsibility in biosecurity
  - trust relationships with professionals, such as private vets, which will make it easier to engage them during an emergency biosecurity response
  - skilled and knowledgeable people that will be valueable in emergency biosecurity responses, for example, private vets learning to take particular samples needed to test for certain emergency animal diseases
  - networks throughout remote areas that support the mental health of isolated practitioners
  - creation of jobs, particularly in remote areas, and a sense of control over local surveillance using fee-for-service contracts with skilled natural resource management professionals and Indigenous rangers.

Surveillance pays off

The cost of doing these sorts of things pales into insignificance relative to the clean-up costs if invasive species come in ***[SWASP interviewee]***

TABLE 1: Program functions requiring resourcing

	Considerations / examples	Guidelines link(s)
	Functions	
Program coordination	• Paid position(s) reduces the risk that vital activities won't be completed in a timely fashion	2.2
Internal stakeholder engagement	• Maintains connectivity throughout the program • Often fulfilled by the program coordinator/team	2.9
External stakeholder engagement	• Builds external networks • Often fulfilled by the program coordinator/team	2.10
Capacity building	• Includes training notifiers, call centre staff and people to use databases • May include training in softer skills such as dealing with members of the public, conflict resolution, etc.	4.4.6, 4.5.1, 4.5.2 6.5.3
Triage	• May be provided by call centre staff in the case of a hotline, program team, appropriate skilled volunteers, or industry body staff who have trust relationships with farmers	5.3.3 Table 2
Database management	• Key to demonstrating worth • Often fulfilled as a paid position with the administrating organisation	2.4.7
Notifier engagement	• Engagement with notifiers requires resources to maintain their support (e.g. training, communication) • Notifiers may be subsidised to cover substantial costs (e.g. travel and accommodation expenses for private vets in remote areas) • Notifiers may be paid to contribute (e.g. Indigenous rangers in northern Australia) • Notifiers may co-fund their involvement if they receive direct benefit from participating	Chapter 4, 4.4.2 4.4.4
Identification/diagnostics	• Must be adequately resourced to avoid creating a bottle-neck and/or staff burnout and turnover • May be absorbed within routine business of government staff but capacity needs to be monitored during high reporting periods, and additional resources allocated, if necessary • Some NGOs contribute to disease diagnostics, such as for wildlife health • Private companies may be suited to identify ongoing routine notifications and clear large influxes • Volunteers may be used to identify online notifications, but significant finds are best vetted through a formalised process • Be aware of the trade-off between accuracy, efficiency and cost of different identification and diagnostic methods • Automated methods can have greater direct costs, but deliver results quicker with less labour than manual methods	5
	Operational costs	
Applications and software packages	• Invest in the careful design, construction and adaptation of applications and software packages to enable efficient notifications	4.5
Equipment	• Examples of sampling equipment that might need to be provided include submission kits for livestock samples, settlement arrays for ports, or insect traps for households • Invest in the careful design, construction and adaptation of effective and practical equipment	5.2 5.4 6.3
Legal advice	• May be required to ensure that duty of care is fulfilled for participants and the program is not at risk of liability	4.6
Workshop costs	• Includes venue hire and catering for training days	4.4.6
Postage and delivery fees	• Subsidise or cover the cost of sample/specimen submissions (i.e. postage or courier costs) to encourage notifications • Printed material may incur delivery costs	4.4.3
Production of communication material	• Includes pamphlets, newsletters, training material and calendars • Costs can be avoided by providing resources online	4.4.3 4.4.6

2.5 Ways to get a general surveillance program started

- The key considerations for initiating a program are discussed throughout the Guidelines. Two popular ways to start a program are by doing pilots and/or tapping into existing networks.
- Work with key stakeholders to develop a program plan, ideally involving a 'program logic' that sets out how activities over time will deliver the desired outcome(s). Monitoring and evaluation can guide progress against this plan (see 7.2).

2.5.1 Consider starting as a pilot program

- Pilot programs are well placed for co-design or 'bottom-up' approaches with notifiers and other key stakeholders. Starting small enables easier in-depth engagement and building trust to later grow the program.
- Early consideration is needed about sustainability and how the pilot will be scaled-up or scaled-out.
- Where pilot participants have a positive experience they often become advocates for the program thereby attracting more support.
- Be mindful that pilots tend to be time and resource intensive, for example, to get the right people involved and equipped to fulfill various functions, finding funding to continue the program and managing the expectations of those who are supporting it.

Start with 'the willing'

I think you can't say enough about ... work with those who want to work with you to start with. Don't give yourselves early roadblocks. I think that's so important for a program like this. Yes, get it up and working, because that allows you to iron out the creases with people that you trust, with that mutual trust, it helps you. ***[SWASP coordinator]***

- Here are some considerations for pilots that proved helpful for other general surveillance pilot programs:
  - begin with stakeholders and notifiers who are willing, rather than focusing on areas or groups that represent the highest risk
  - be flexible, expect and work through 'teething problems'
  - work closely with notifiers and others in the system to see how the program can better meet their needs
  - learn from others who have been through a similar process, such as in a different jurisdiction
  - engage with important stakeholders who are 'nay sayers', bring them on the journey by showing that their objections are considered and demonstrate how related issues are being addressed
  - have a staged approach as part of the pilot so each stage can learn from the previous stages
  - allow enough time and resources for engagement and to address unforeseen issues.

2.5.2 Identify networks and programs that can be tapped into

Existing networks

- Identify and get to know existing networks that could be engaged to support a new program, such as farmer, volunteer or community groups, or private vet or on-farm consultancy networks. This includes knowing:
  - the capacity, willingness, motivations and barriers of the people in the network(s) to participate and contribute to surveillance
  - how different groups interact.
- Once networks are engaged they can be built upon (see 2.9 and 2.10 for building internal and external networks).

Existing programs

- Benefits of integrating a general surveillance program into an existing program (such a program with other biosecurity purposes, or a hotline for reporting compliance issues) include utilising resources from the program, such as funding, staff, volunteers and networks.
- Challenges may include:
  - sample design of the existing program (e.g. distribution, type and frequency of monitoring) may not match the goals of the general surveillance initiative
  - limited control over the administration of the larger program
  - being tainted if the larger program has a poor image.
- Challenges can be managed with clear communication and an effort to build the internal networks between the programs (see 2.9).

2.6 Align a program with its context

- Ensure a new program (or an existing program with major changes) fits in with the prevailing policy, operational and social environment. This requires knowledge integration (see 2.7).
- This may take considerable time, effort and cost on behalf of the program itself as well as for the various groups and organisations who are expected to contribute. This means program planning and design may need to:
  - ensure the general surveillance program complements existing arrangements for specific pests, weeds and diseases - such as for active surveillance, and plans and activities relating to response, eradication, management and preparedness
  - endeavour to accommodate the priorities of government, industry and/or the community to maximise support from all
  - comply with existing processes and requirements, such as for pest and weed identification and disease diagnostics, reporting, data management, and legal considerations. Sometimes the needed processes and guidance do not exist, for example, some general surveillance programs had to develop the privacy guidelines from scratch as no precedents existed in the mother organisation
  - allow time and potentially allocate resources to support partner teams and organisations to make changes – for example, a lab or herbarium to put in place processes and procedures to accommodate a surge in notifications; or servers to deal with an increased data load
  - allow for establishing effective working relationships between organisations, for example, it can take months to achieve smooth operation when a government organisation enlists the services of a new private call centre
  - consider contextual factors, including tailoring messaging to prevailing trends or behaviours in target groups. Contextual factors may include things such as community fads (e.g. people trading plants on social media); diverse community values (e.g. some may want to protect certain weeds as they are seen as habitat for animals); or risky behaviours (driving sick animals with unusual symptoms to the vet may spread an emergency disease).
- Other considerations include:
  - other teams in a large organisation may not always appreciate the relevance of a general surveillance program to them, and may lack responsiveness
  - there could be resistance from some teams, especially if the program requirements add to already hefty workloads.

Sources of risk are constantly changing

Every other day we're finding a new Facebook group selling or trading in plants and seeds … Those are the people you really want to engage with because they're sort of a higher risk population or group of people, I'd say ***[NZ Plant Health Incursion Investigator]***

Context alignment for MyPestGuide™ Reporter and the Pantry Blitz

The MyPestGuide™ team worked with various other teams in WA Department of Primary Industries and Regional Development (DPIRD) to ensure the department supports the reporting tool and the Pantry Blitz activities. It took time and effort to convince different biosecurity managers that the data collected using the app could support future biosecurity work. The project team worked with their developer and IT team to ensure the server could handle the added load of reports including multiple photos. Liaison with the legal team was needed to deal with privacy issues and any public complaints. However, as the program was new to the department there were no precedents or policies/procedures in place for some issues including how to deal with OH&S issues, such as if someone had an allergic reaction to a substance on the trap or the trap accidentally got stuck to a child or pet. The MyPestGuide™ team thus developed new procedures. At the time the Pantry Blitz's friendly, personal engagement style with the community was at odds with the department's communication style that tended to be more formal and risk averse. Some pathways did not exist, e.g. the program team had to work with various DPIRD teams to instigate a pathway for Pantry Blitz specimens to reliably reach the department's identification team in a timely manner. The MyPestGuide™ team continues to support various teams and functions within the department during times of change, such as part of a departmental restructuring process.

2.7 Integrate knowledge

- Good program management enables the integration of knowledge from a wide and diverse range of sources both at the start and throughout a program's lifetime. Knowledge integration delivers a nuanced understanding about how to best design a program that is sustainable, practical for all involved and effective in achieving its goals.
- When programs are planned or when changes are introduced it could be easy to assume that certain people or systems will contribute to the program with little understanding of their ability or the feasibility to contribute in a prescribed way.
- Knowledge about different subjects (e.g. related to the life sciences, policy, trade, data management and analysis, etc.) and from the practical experience of people across the program needs to be integrated.
- Undertake a stakeholder analysis to identify for each stakeholder (group) their expected role (e.g. partner, collaborator, supporter, etc.), their influence on and relevance to the program; and other information such as their needs, priorities, and enablers and barriers to their support of the program.
- Be mindful of 'knowledge hierarchies' that influence whose knowledge counts most. Scientific or technological knowledge could easily be favoured at the expense of local knowledge, which is key to ensuring notifiers participate in a program.
- Key ways to achieve knowledge integration are through:
  - establishing communication and interactions between key people
  - using knowledge brokers
  - documenting the integrated knowledge, for example, in the surveillance plan and standard operating procedures.

2.7.1 Use knowledge brokers

- Knowledge brokers are well-connected individuals who have an in-depth understanding of different groups contributing to a general surveillance program. They facilitate connection and information flow between these groups. They are well placed to:
  - understand how a change in one group can impact another group
  - 'translate' information between diverse groups, such as government officials and farmers, or app developers and community groups, as they know what language, concepts and examples will resonate with a particular group
  - connect individuals with others that can be of value to them
  - help identify solutions to issues that will be acceptable to both parties.
- Care is needed to not overload knowledge brokers as it can be a demanding role.

Examples of knowledge brokers

Indigenous liaison officers are conduits between scientists, administrators and the Indigenous rangers who work on country. Successful officers usually have a deep understanding of cultural issues affecting Indigenous people's participation in surveillance; and of government processes and requirements.

Various general surveillance programs have a 'trusted friendly face' role who notifiers can turn to if they have questions. These could be carefully selected volunteers, or government staff not employed by a general surveillance program, but who interact with notifiers in other capacities. They often have a good understanding of both notifiers' and program administrators' perspectives.

Government vets sometimes support private vets to encourage them to contribute to significant disease investigations. Several government vets have been private vets in the past so they understand the pressures private vets are under. They understand the internal workings and pressures of their government department.

2.8 Define roles and responsibilities

- Clearly define the roles and responsibilities of all involved to facilitate quick responses where needed and to minimise the impact of staff changes. Key areas for consideration include:
  - task allocation throughout the system. For example, a well-designed reporting tool is of little use if no one is clearly tasked with ensuring notifications coming through are checked regularly; are verified; and people are tasked and authorised to initiate the appropriate response
  - monitor task allocation over time. For example, a person might initially be responsible for all notifier interactions, but over time it becomes more effective to have one person focusing on providing notifiers with technical support and training, and another addressing any concerns and complaints from notifiers
  - clear guidance and procedures for key roles that are regularly reviewed and updated, such as escalation processes when a priority pest, weed or disease has been identified. Diagrams can be helpful when staff are under pressure. Agreements can assist with clearly spelling out expectations
  - handover points of responsibilities. For example, between people responsible for investigating a notification and those responding to a confirmed detection
  - responsibility for different pests, weeds and diseases for programs with a wide scope especially if highly specialised skills are required to identify/diagnose them
  - clearly specified contact people for key communications, such as when a priority pest, weed or disease have been detected; or for communication between two organisations or large groups, to prevent mixed messages and to coordinate requests

- needs for capacity building. For example, where lab staff need to provide feedback to notifiers, they may benefit from guidance on interacting constructively with community members to ensure a positive reporting experience. Other staff interacting with the public following a suspected detection may benefit from training in conflict resolution and other skills to enable smooth and productive interactions.

2.9 Maintain connectivity throughout the program

- Establish connections between people fulfilling the same and different functions within a general surveillance program to share and integrate knowledge.
- These functions include data collection, identification/diagnostics, data management, etc. with representatives often spread across geographical locations, scales, departments and/or networks.

2.9.1 Connect individuals fulfilling the same function

- Such connections lead to learning from each other, mutual support, trouble shooting, sharing ideas, discussing common challenges and achieving greater consistency in how tasks are done.
- Where individuals are working at different locations, connect them through face-to-face and/or online meetings, online chat forums or get-togethers, for example, in conjunction with other events that most are likely to attend.

Team interactions strengthen consistency

And then we [program coordinator and government vets supporting notifiers] would get together and we'd share aspects of the program and what we've been doing, trying to get our messages consistent. I really had excellent feedback from them [government vets] on that, because it was such a good opportunity for everyone to talk about their jobs together and get a sense of being a team. ***[Livestock general surveillance program coordinator]***

2.9.2 Connect teams/individuals representing different functions

- Such connections can be beneficial for:
  - people better understanding how their actions are affecting others and/or how they can support others in the system. For example, for notifiers to appreciate the additional time and effort that is required from lab staff when they submit incomplete reports; or for program administrators to appreciate the practical implications of the program requirements to notifiers; or for data users to appreciate the effort required from data managers to format data to their specifications
  - building trust, facilitating mutual understanding and self-organisation, such as the people representing different functions identifying ways to overcome an issue that involve them all, rather than relying on program managers to solve it
  - the identification of blind spots
  - speeding up processes and improvements, and preventing costly delays and dealing with issues in retrospect
  - enabling information flow and learning.

Interactions overcome blindspots

They [potential notifiers] give us the most practical advice, it's incredible. They say things like 'Stop telling me to take a photo of the bug … Phones are not allowed …' You're kind of going wow, we never, ever thought of that. ***[Biosecurity comms manager]***

Interactions can quicken diagnosis

I find it's very important to involve the laboratory people in what's going on. I go and talk to them in the micro lab so that they're not doing unnecessary tests … I think it gives them much more interest if they hear the whole story behind things. ***[Government vet]***

2.9.3 Ways to strengthen connections and information flow between people representing different functions

- Appoint a good coordinator – to ensure connections are being made and maintained throughout the program.
- Instigate face-to-face meetings – for people to interact, such as regular get-togethers or one team visiting another.
- Encourage long standing trust relationships that maintain corporate knowledge – to support a shared understanding about a program, its challenges and opportunities.
- Locate different teams close to each other, such as on the same floor, to allow for direct and impromptu information exchanges.
- Set agreed communication arrangements, such as the engagement team liaising with lab staff on when to run a particular campaign that will promote reporting, to ensure it fits within the capacity of the lab staff.
- Appoint clear 'go to' people – to have clear communication lines to prevent mixed messages from one group to another.
- Instruct people to be responsive to the needs and requests from those fulfilling different functions, such as including it in training and briefings.
- Engage 'upwards' – to ensure senior managers are aware of the successes and importance of a program, and its needs and practical realities.
- Initiate frank discussions about the needs and limitations of different teams when necessary, but manage it well to prevent tension from lingering.

NABSNet Masterclass 2020

Interactions foster team building

... the first event was a master class to get them together to go through all the business of doing disease investigations, and meet the others in the network, and meet the pathologists who they might be sending those samples to ... at the end of a couple of days, people were eager to be part of a more collective something. ***[Consultants supporting NABSNet]***

2.10 Build external networks

- Networks with external stakeholders can offer various benefits. They may include local governments, other government agencies, scientific organisations, industry bodies, community groups, NGOs and those related to a particular industry (such as livestock transporters, knackeries, abattoirs and fencing contractors). External networks can contribute to things such as:
  - meeting notifier expectations – for example, to be able to refer notifier inquiries that are outside the scope of the program to people who can help, such as questions about the management of other pests, weeds or diseases
  - knowledge brokering – for example, where industry body staff have trusted relationships with farmers, they could relay monitoring and reporting messages to them in language that resonates with them. These staff members are also well placed to explain to the program management team what farmers' perspectives are, which can assist with finetuning messaging and addressing barriers
  - learning – for example, networks with other general surveillance program staff can offer insights into what works and what does not work. Networks with scientists can assist with staying abreast of the latest relevant scientific developments
  - having more 'eyes and ears' – for example, when a significant detection has been made, wide networks mean more people can monitor for further occurrences
  - specimen collection or checking-in on notifications – for example, remote areas may not be well serviced by courier services, or it might be difficult for vets to reach at short notice. Having relationships with suitably skilled people could assist with the timely attendance to these cases
  - identification/diagnosis of unusual specimens/samples – such as lab or herbarium staff that are well connected with other experts that they can turn to when unsure
  - program promotion – for example, connecting a program in with other large events, such as a science festival can increase awareness
  - program legitimacy – when people hear positive comments about a general surveillance program from external entities it increases the credibility and legitimacy of the program.

2.10.1 Ways to build and maintain external networks

- Many of the ways to facilitate effective connection within a program, discussed earlier, also apply to cultivating external networks. These include a good coordinator, personal contact and face-to-face meetings, maintaining long standing trust relationships and being responsive to the needs and requests of key stakeholders.
- Other strategies to support building external networks include:
  - conducting a stakeholder analysis to better understand who are potential sources of support, including their motivation, capability and capacity
  - building relationships with people who are well-connected – for example, well-connected volunteers (such as those working for organisations where people work outdoors) offer access to more 'eyes and ears' when something significant is detected
  - leveraging existing stakeholders' networks
  - attending events, such as conferences and seminars to build networks
  - organise meetings that will draw the people you would like to network with.
- Other considerations that are helpful in cultivating enduring external networks include:
  - aiming for mutually beneficial relationships – so there is a sense of reciprocity
  - maintaining a positive program profile – by reminding stakeholders of the benefits, goals and achievements of a general surveillance program so they feel part of something bigger that is making a difference
  - being sensitive to the pressures others are under – even when an individual, group or organisation is well placed to assist with particular tasks, if they are under considerable strain due to their current responsibilities, requests for support can exacerbate an already challenging situation.

2.11 Further reading

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Further reading about program resourcing

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Documents that provide guidance to develop a program logic:

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3 Pests, weeds and diseases and their environment

Key points

- The characteristics of pests, weeds and diseases and their hosts, affect how general surveillance programs are best designed and determine many of the limitations of surveillance activities.
- Engage scientists with expertise in the relevant pests, weeds or diseases to ensure the general surveillance program is underpinned by sound science.
- Consider their detectability, which depends on factors such as their density, size, spread, recognisability and concealment.
- Consider risk pathways which influence geographical spread. It influences who is best placed to detect and report them.
- Identify when pests, weeds and diseases are most detectable. For example, it may be certain seasons or parts of their lifecycle.
- Consider environmental factors that may influence the prevalence and spread of pests, weeds and diseases and the ability to monitor and detect them.

- Many programs experience a surge in reporting during the warmer months when more people are out and about.
- Be aware that people's attitudes to certain species may influence their willingness to report them.

3.1 Introduction

The traits of pests, weeds and diseases, their environments and the way people perceive them should have a strong influence on designing general surveillance programs.

3.2 Consider the characteristics of pests, weeds and diseases

- Engage people who are experts in the relevant pests, weeds or diseases to provide input into program design, particularly the approach to sampling (see 6.3).
- Pest, weed or disease characteristics affect things such as:
  - how they spread, their potential range and vectors
  - where and when general surveillance efforts would be most effective
  - health and safety considerations (see 4.6.2)
  - who would be best placed to be notifiers
  - the best tools to make detections
  - the skill and tools needed to undertake identification/diagnostics and where the best place is to get it done
  - the transport and permit requirements to move samples/specimens.
- Identify which species are a higher priority for surveillance due to their ability to cause much damage and spread quickly. Certain diseases are a higher priority due to their infectiousness or wide host range.

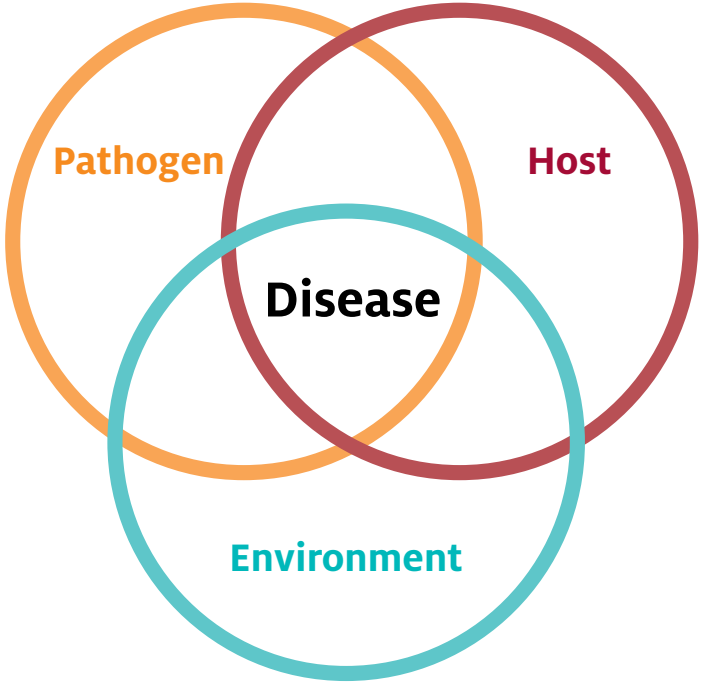
Biophysical science must underpin notifier engagement

I think the key is to have that … science person driving it. … Because it's very easy to turn into a comms and engagement type project. ***[MyPestGuideTM interviewee]***

3.3 Consider the detectability of a pest, weed or disease

- People's ability to recognise particular pests, weeds or diseases varies.
- Consider the tools and technologies available to detect certain species, such as traps and lures.
- The presence and spread of disease result from the interaction between the pathogen, the host and the environment (Figure 3). Looking for a disease is not worthwhile in locations where there are no suitable hosts or environments.

FIGURE 3: The disease triad



3.3.1 Consider abundance and distribution

- Identify what influences the abundance of a pest, weed or disease, such as reproduction rate, climate, transmission rate for infectious diseases, habitat suitability and the time it had to multiply.
- Identify what influences the distribution of a pest, weed and disease, such as environmental factors (see 3.6) and where applicable, vectors and hosts. Different hosts may have varying levels of susceptibility.
- Consider the mobility of an organism, such as its ability to move itself; spread through wind, waterways or rain; or be carried by vectors. Some may 'hitch hike' on vehicles or boats resulting in long-distance dispersal.
- Be mindful that the higher the density and spread the more easy a pest, weed or disease is to detect, but the lower the chance that eradication or containment is still feasible.
- People may forget or lose interest in looking for new and emerging pests, weeds or diseases because they are so rare and/or show no impact. Add species that are present so people find things to report. For example:
  - where people are asked to monitor traps to detect an exotic species, adding a generalist lure to the exotic species specific lure so catching something is more likely
  - combining surveillance of exotic and native species, so the program has biosecurity and biodiversity value.

3.3.2 Consider recognisability

- Consider the recognisability of pests and weeds, including their size and appearance.
- Disease symptoms may appear like other conditions, such as nutritional deficiencies or forms of poisoning.
- Consider how a disease is likely to present as it may depend on factors such as the host-pathogen relationship, incubation period, the presence of carriers, or whether there is intermittent shedding or intermediate hosts as part of its lifecycle. Some diseases show different clinical signs in different age groups of the same host species.

- Expect more notifications of species and symptoms that are more noticeable.
- Identify 'look alike' species that may be confused for some pests and weeds as they can be a significant source of out-of-scope species that lab or herbarium staff need to deal with. It may be valuable for lab and herbarium staff to learn more about them.
- Encourage people who have reported a 'look alike' to report subsequent similar detections, and not disregard them as more 'look alikes'.
- Inconspicuous species, signs or symptoms are more likely to be reported by experts.
- Consider how species, signs or symptoms that may be concealed can be best detected, such as in aquatic environments when visibility is low; if plant disease signs first appear on roots systems; and larval nests of insects of concern reside at the top of trees.

3.4 Consider the source and spread pathways

- Understand the risk pathway(s) of exotic, new and emerging species to identifying where a pest, weed or disease is most likely to be first detected and therefore who to engage as notifiers.
- Consider if disease may present itself once certain environmental or host factors align, rather than being introduced from elsewhere (Figure 3).
- When programs cover large areas such as a state or territory, consider if priority species or diseases in one area differ from other areas. This may have implications for engagement activities.
- Identify different risk zones for certain organisms with tools such as Geographical Information Systems. The chances of establishment and spread in a particular area depend on the probability of arrival and the area's suitability as a habitat.

3.5 Consider temporal factors

- Identify if there are certain times when a pest, weed or disease is more likely to be observed and/or detected, or when it is most abundant to allow easy detection, such as when:
  - some weed species are in flower
  - some insects are in a certain stage of their life cycles.

3.6 Consider environmental factors

- Identify the environmental factors that could contribute to the prevalence and spread of a pest, weed or disease (including their hosts or vectors). For example, stress tends to make animals more susceptible to infection. The growth of bacterial species are related to temperature.
- Consider what other environmental factors could mimic signs and symptoms, such as nutritional deficiencies, poisoning, insect damage on plants, climatic factors or stress.
- Consider the likelihood of detection as a result of the environment, for example, disease is easier to detect in intensive farming systems than in the wild where large numbers of wildlife or plants can be affected without being noticed.
- Identify factors that may affect the accessibility of monitoring sites and the approach to sampling. Examples include tendency for cyclones and storms, the presence of crocodiles, cold climate and wet seasons.
- Understand how environmental conditions may influence people's monitoring behaviour, for example, notifications may surge during the warmer months when people are out and about.

Seasons sometimes set surveillance scope

Seasonality is everything up here ... It's almost an on, off system. In the wet season, it's very hot and it's very wet. And the roads are closed and the paddocks are too wet to get anywhere or to do anything. And so any kind of disease investigation is difficult. ***[NABSNet interviewee]***

3.7 Consider people's attitudes towards certain species and diseases

- People's attitudes towards species are shaped by the perceived level of threat to themselves, ecosystems or other organisms that they value; and the aesthetic and cultural value placed on the organism. For example:
  - if they pose a direct threat, such as if they bite or sting, people are more likely to report
  - closer proximity of problems caused by an invasive animal increases people's negative attitudes towards the species
  - animals that could have been companion animals or those that are large, attractive mammals are viewed more favourably than non-mammalian species and rodents. Some people may be reluctant to report them in fear that they might be killed
  - some people have strong attachments to certain plants, such as when they have cultural significance or are good to eat
  - some species are of interest or value to certain groups or individuals. Revealing their location may attract unwanted attention from people trying to find and remove them, which may lead to further spread.
- Pests, weeds and diseases that are well recognised, present at higher densities or have impacts that are more visible, are likely to elicit more negative attitudes than those not present yet.

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4 Engaging notifiers to monitor and report

Key points

- Carefully consider who is best placed to be notifiers. Notifiers can come from diverse groups, including the general public, landholders and managers, Indigenous communities, private businesses (including private vets, crop consultants and some ports) and others.
- Effective notifier engagement requires working with the motivations, barriers, expectations and needs of notifiers.
- Effective engagement supports high retainment of notifiers. Through time this leads to more educated notifiers who deliver quicker, more accurate reports. It prevents spending scarce resources on finding and training new notifiers.
- Consider the needs of both notifiers and those dealing with the incoming data when reporting tools are chosen and designed. Poorly designed reporting tools can add considerably to workloads elsewhere in the program.

- Ensure measures are in place to respond to legislative requirements such as those related to enlisting volunteers, health and safety, liability, privacy and intellectual property.

4.1 Introduction

Various people may be asked to monitor and report certain pests, weeds or diseases based on their skill sets, location, interest or other reasons, depending on the needs of a program. Monitoring means people looking out for suspect species, signs and/or symptoms. Reporting refers to people notifying the relevant authorities or others about the presence of suspect species, signs or symptoms.

4.2 Understand the notifiers involved

- Notifiers are diverse, even within a group, such as farmers, or within a region.
- Raising awareness of a program may not be enough to secure participation. Often barriers preventing support need to be addressed as well.
- People's motivations and barriers can change over time and it is important to monitor them.
- Ways to identify motivations and barriers include undertaking focus groups and surveys.
- Below is a short profile of some key groups, including motivations and barriers. Other potential notifiers not covered include people working in the outdoors, such as parks and wildlife rangers; managers of public infrastructure, such as roads; or culturally and linguistic diverse communities.
- It is important to invest in understanding notifiers' perspectives for any particular program as they vary between different contexts.

4.2.1 General community

- Diverse, including various interest groups, such as LandCare groups, community gardeners, bush generators, schools, youth groups, university groups, etc.

Motivations for participation may include

- concern for the environment or agriculture
- contributing to science
- protecting areas people value
- learning more about things that interest them
- because it is the right thing to do.

Barriers to participation may include

- lack of time
- lack of knowledge and skills
- forgetting about reporting
- concern about social repercussions if they report something on a neighbour's or friend's property
- not knowing what to expect when reporting, including expecting consequences such as fines
- concern about reporting things that are out of scope
- previous negative experiences.

4.2.2 Landholders and managers

- Diverse, including commercial farmers, hobby farmers and peri-urban landholders.

Motivations for participation may include

- learning about the pests, weeds and diseases that affect their production
- preventing more pests, weeds or diseases from establishing.

Barriers to participation may include

- fear of quarantine, social stigma and exclusion if their notification causes a biosecurity response
- not being highly motivated by exotic pests, weeds and diseases as they are not causing impacts
- not understanding the importance of pest freedom to maintain lucrative export markets, which also assist in keeping domestic prices strong
- for programs based on vets or on-farm consultants, not all farmers use their services.

- Other factors that may influence participation include the notifiers' ability to identify relevant organisms, signs or symptoms; belief in self-efficacy or capability to take required action; and level of engagement with their social networks (i.e. peers).

4.2.3 Indigenous communities

- Many Aboriginal and Torres Strait Islander people rely on their environment for food, medicinal, cultural and other needs.
- Their traditional knowledge may be valuable to detect and deliver notifications of unusual organisms and symptoms.

Motivations for participation may include

- interest in caring for country, including deriving increased well-being, pride and self-worth from it
- avoiding impacts from pests, weeds and diseases
- finding employment with connections to family, culture and country
- opportunities to be role models for younger people
- being recognised as traditional custodians of country by applying cultural knowledge.

Barriers to participation may include

- loss of traditional knowledge as elders pass away
- limited opportunity for women and young people to participate in ranger programs
- lack of resources, for example, rangers' vehicles may be worn-out.

4.2.4 Private businesses

- Examples include private vets, on-farm consultants, service providers (such as crop scouts, ship hull cleaners, etc.) and port authorities and industry ports.
- Key aims of a general surveillance program (e.g. proof of pest or disease freedom) do not always align well with the key goals of private businesses so they may have limited intrinsic incentives to support a program.

Motivations for participation may include

- strong value proposition by contributing to achieving business goals or fulfilling needs. This includes assisting businesses to deliver better services, such as access to low cost identification or diagnostic services; or meeting legislative requirements
- maintaining social licence
- protecting species or areas they care about
- networking opportunities
- acquiring new skills or knowledge.

Barriers to participation may include

- distrust in government
- surveillance activities are not front of mind
- time pressures or competing priorities
- potential damaging relationships with clients when reporting something on their land, including breaching confidentiality agreements with clients
- onerous requirements, such as much paperwork.

4.3 Consider appointing people to support notifiers

- Work with people who represent 'trusted friendly faces' to notifiers to foster on-ground trust and relationships.
- They can be trained volunteers, program staff, industry body staff, or independent people employed to fulfil this role.
- The role usually involves fielding questions, encouraging monitoring and reporting, providing support with preparing samples or specimens, and triaging notifications by advising notifiers whether reporting is needed.
- They may have valuable local knowledge or species specific expertise, and/or helpful networks that can contribute to the program in various ways.
- Make use of their knowledge as a source of on-ground intel to be more responsive to on-ground needs.
- Allow for flexibility in how the role is performed.
- Be mindful of potential challenges, such as:
  - other commitments that constrain how much they can contribute
  - some people being more able to build a good rapport with notifiers than others
  - potential variability in how the program rules are being interpreted.

4.4 Establish effective engagement with notifiers

- Effective engagement encompasses gaining and maintaining the trust, respect and support of target group(s).
- Be realistic about the time and effort required as it can easily be underestimated. Effective engagement:
  - maintains the reputation and legitimacy of a program
  - facilitates high retainment of notifiers, which leads to more educated notifiers who deliver quicker, more accurate reports, thereby minimising the need for new recruits and investment in their training
  - requires maintaining momentum.
- The consequences of poor engagement include:
  - a lack of people 'signing-up' or supporting the program
  - a high rate of notifiers dropping out. People who had negative experiences can be difficult to re-engage
  - increased negative 'word of mouth', which can be damaging to a program's reputation and discourages others from supporting a program.
- Key principles for effective notifier engagement are discussed below, regardless of the notifier group (e.g. general public, professional individuals or businesses).
- Consider having one person as the key contact point for notifiers and who can build relationships with them.
- Undertake a stakeholder analysis of potential notifiers if diverse groups are involved, including rating their motivation, capability and capacity.
- Be mindful of any rules and regulations that may apply, such as compliance with advertising standards and codes for public campaigns.

Poor engagement disengages

We found that some people had a negative experience with [the program] and never went back to it, or were sharing their opinions about it for many years. ***[Program coordinator]***

The importance of trust

- Trust is the belief in the reliability of people or systems, including their goodwill, abilities, capabilities and integrity. It is often associated with a sense of reciprocity.
- While intangible, trust offers many benefits, including:
  - lowering people's perception of risk which facilitates working relationships and voluntary collaboration and cooperation
  - delivering greater patience when a general surveillance program is facing challenges, such as issues with technology
  - strengthening the legitimacy of a program and facilitating support from more notifiers
  - offers a platform where other biosecurity messages or initiatives can be introduced.
- People's trust in government and scientific findings cannot be assumed. It is important to understand the perspectives of a particular group, including who they trust. Working with or through individuals that a particular group respects or look up to is a powerful way to win their engagement.
- A lack of trust increases costs, such as those associated with on-going negotiations, or developing and enforcing regulation.
- Trust can be built by demonstrating goodwill, regular and transparent communication, capabilities and integrity.
- Repeated positive interactions between program staff and notifiers build trust, such as through workshops, hands-on demonstrations or face-to-face training. It can be helpful for government staff to 'take off their regulator hat' and focus first on building trust relationships.
- Quick and reliable follow-up processes with notifiers helps maintain trust, including in response to enquiries and by providing prompt feedback about what notifiers have reported.

Positive experiences instill trust

People know if they call that number, they're not going to be put on hold for five minutes waiting to talk to someone and they know that if they report it, something is going to be done. ***[NZ General Surveillance Program interviewee]***

Trust enables continual improvement

DPIRD has been very transparent, they've given us access to the books, … they've been pushing to research and refine the methodology over time, and they've supported that collaboration over the years and built on that trust. It's been a really fantastic project. ***[Port environment manager]***

4.4.1 Incorporate notifier perspectives in program design

- There are various levels of engagement to incorporate participants'—including notifiers'—perspectives. See table below.
- Giving notifiers (or their representatives) input in program design (or aspects thereof) is recommended.
- The level of notifier input can vary between groups and over time. Some programs start with a co-designed pilot with a small group of willing notifiers and later move to consult or involve if changes are planned.
- Balance the need for engagement—to ensure people have enough information and opportunity to provide input—with the risk of over-engagement which may lead to disengagement.

More notifier input leads to ...

- increased trust
- notifier requirements that meet their needs
- higher retention rates
- less need to address issues in retrospect
- quicker, more accurate reports.

More notifier input requires ...

- financial investment, time, skill and trust-building on behalf of the program
- balancing various needs, which can be difficult
- more time and effort from notifiers. Consideration is needed about how to make the best use of their time.

TABLE 2: The engagement spectrum

	INFORM (No input, completely 'top down' - We are letting you know about the program)	**CONSULT** (Input on 'top-down' defined matters - Will this work for you?)	**INVOLVE** (Openness to 'bottom-up' input - How can we make the program better?)	**COLLABORATE/CO-DESIGN** (Working together as equal partners)
TOOLS	• Fact sheets • Website • Identification guides • Handbook • Social media (responses not considered)	• Surveys • Public comment • Social media (responses somewhat considered)	• Focus groups • Workshops • Public meetings • Social media (responses key part of decision-making)	• Participatory decision-making • Consensus building

Adjusted from the National Biosecurity Engagement and Communication Framework, Australian Commonwealth Government, 2013, available at www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/animal-plant/pihc/bepwg/national-engagement-communication-framework.pdf

4.4.2 Ensure a clear value proposition for notifiers

- Sustaining support from notifiers is easier if they see clear direct benefits to them.
- Notions of shared responsibility or that notifications may contribute to claims of pest or disease freedom in trade negotiations may be too far removed for the general community, most farmers and even professionals, such as private vets.
- Balance the value proposition with the effort, skill and time required from notifiers. A stronger value proposition is needed when more time and effort are requested.

Examples of value propositions for notifiers

- Tap into people's passion for an issue and demonstrate that the program is contributing to support it, such as environmental sustainability.
- Enable professionals to deliver a better service to their clients, such as helping vets and on-farm consultants, through financial and other support, serve farmers better.
- Assist private businesses to maintain their social license by ensuring participation in the program helps them demonstrate stewardship of the environment.
- Provide a sense of fun and an opportunity to engage with science, such as through well-designed citizen science programs.
- Tap into people's needs and wants, such as young people's need for work experience, a way to remain active and contributing to society for early retirees, professional networks for experts, opportunities for outdoor enthusiasts to learn from experienced professionals, or the opportunity to spend time with experts.
- Incentivise reporting, such as offering a reward or bounty for a positive notification of high significance, as was done for the Great White Butterfly in Nelson, New Zealand.

Notifiers need to see benefit to them

If somebody's doing something for you, you have to give something back to them, otherwise they'll walk away from it. ***[MyPestGuide™ staff member]***

4.4.3 Make participation simple, user-friendly and low cost

- Ensure requested tasks and finding the required information are as easy, cheap and quick as possible for target groups. This relates to a range of things:
  - easy sign-up process – e.g. at events without needing to do anything else at home
  - practical monitoring and reporting – understand if there are cumbersome aspects and how they can be improved
  - different notification avenues – cater for different preferences
  - low administrative burden – minimise the information and levels of sign-off requested
  - conveniently timed activities – such as training events during quieter times of the year, or days/times of day that suit target groups
  - easily accessible information and resources – clear, succinct program requirements, test draft documents with target groups. Photos, videos and electronic text messages are helpful
  - communicate through various channels – so people hear messages repeatedly
  - tell narratives about interesting finds and responses – translate scientific information into everyday English
  - accessible websites – consider having a landing page in simple and plain English with links to more detailed or technical information
  - easy-going interactions with notifiers – aim for interactions that have a sense of the program being 'fuss free'
  - sample or specimen submission – consider providing sample submission kits and/or post-paid packs for easy submissions
  - remind people about the program – particularly if the scope involves exotic and new and emerging species where the likelihood of an encounter is slim.
- People appreciate flexibility – consider what aspects of the program need to be done consistently and where there is room for flexibility.

Know what works

The key driver for us to continue with SWASP is that it's a low-cost, collaborative and robust marine biosecurity program … It isn't encumbered by a raft of paperwork or other formal arrangements that require signoff at the highest level. ***[Port representative]***

Less is more

More information is not always going to make it easier for people to understand. ***[MyPestGuide™ communication person]***

Pantry Blitz trap

4.4.4 Target groups well placed to support surveillance

- Targeting certain groups to strengthen the quality of notifications tends to deliver cost-effective outcomes, even if the program is open for anyone to participate.
- The quality of notifications depends on the timeliness, accuracy and completeness of what is being reported.
- People could be targeted on traits such as:
  - motivation
  - skill
  - geographical location
  - time spent in the outdoors.
- It may be easier to maintain the involvement of a small core group of notifiers who have a keen interest, especially if the program staff have many other responsibilities that limit the time they can spend on notifier engagement. However, the potential for notifier burnout associated with greater involvement should be considered.
- The best group to target may change through time. Engagement at the start of a program, such as part of a pilot, may be with those who are 'willing and able' to participate. Once the program is more established, others could be engaged, including those in higher risk areas.

Tailor engagement

- Get to know your target groups, for example by:
  - interacting with them directly, especially when small groups are involved
  - working closely with people who know a target group well, such as vets or agronomists who may know farmers well
  - undertaking social research, such as surveys or focus groups.
- Understand your target groups' perspectives and adjust the program accordingly, including:
  - timing and choice of engagement channels
  - choice and design of reporting tools
  - tailor messages based on 'What is in it for me?', focus on direct benefits
  - being aware of things that might be counter-intuitive such as requests to submit photos of empty traps. Remind notifiers regularly and clearly of the importance of doing so.

Targeting strengthens cost-effectiveness

When the program started … I got the impression that we tried to train up as many people as we could … A lot of people did it because they are interested in gardening … but most reports came from Parks Victoria, local government, contractors, or people working in the field. So we reined back and became more strategic with the training and offered it more to groups who are likely to come in contact with weeds. ***[Weed Spotters Victoria interviewee]***

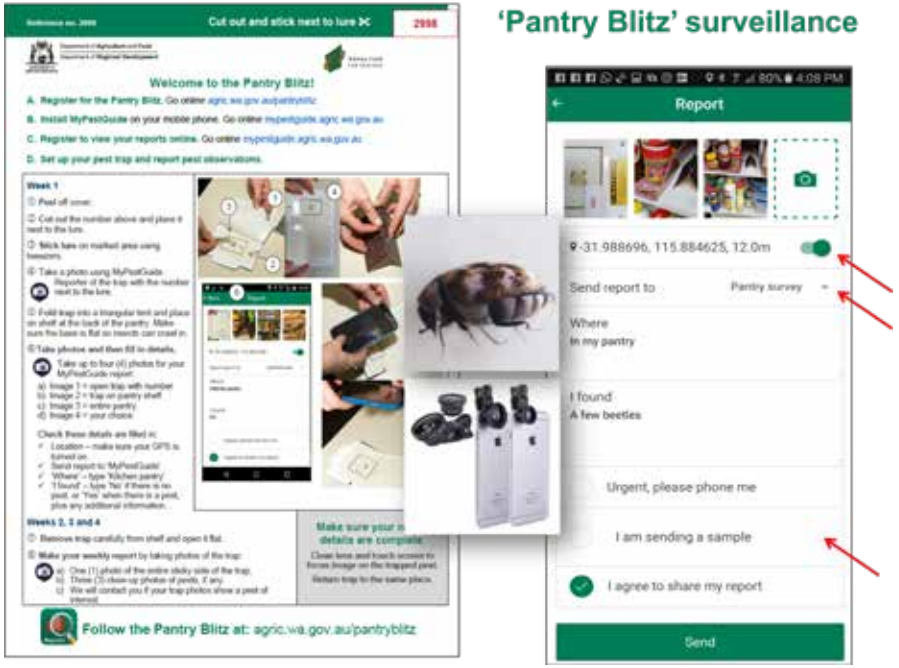
4.4.5 Deal with expectations

- Notifiers usually expect various things from a general surveillance program. Be aware of what the expectations are to know how to keep notifiers satisfied.
- Take care to not overstate what notifiers' support will contribute to. For example, stating that participation will contribute to protecting the environment, may create expectations that people will turn up to check out suspected detections and undertake treatment measures.
- Not all expectations can be met, but knowing what they are assists in communicating about them, clarifying situations, or to potentially find alternative avenues to have them met.
- Basic expectations include:
  - having a positive reporting experience (see 4.4.7)
  - evidence that the program is making a positive difference
  - legal requirements have been considered and are in place, such as in relation to privacy, intellectual property and health and safety (see 4.6).
- Others notifier expectations could include:
  - that an official person will turn up promptly to investigate the report. This is particularly associated with hotlines
  - wanting to make the report only and being reluctant to participate in follow-up activities such as collecting a sample or submitting a photo
  - assuming they will receive a quick and definite identification/diagnosis, but sometimes this involves lengthy procedures and only exclusion of certain diseases may be possible
  - being keen to connect with others contributing to the program
  - wanting to do more towards the cause, such as management related activities
  - wanting to know what has been found in their local area.
- Communicate to notifiers what they can expect after they have made a report. Not knowing what to expect when making a notification can cause uncertainty, and deter people from doing so. For example:
  - develop materials about what happens once a notification has been received
  - let notifiers know if there is an high number of notifications that are causing a delay in providing feedback
  - share stories about unusual detections, including what happened afterwards. For farmers, this may be valuable to see that in most cases reports do not lead to quarantine measures.

4.4.6 Support notifiers in their tasks

- Supporting notifiers helps them and the rest of the general surveillance program:
  - notifiers develop deeper trust in the program and are better equipped to deliver quality notifications
  - quality notifications prevent delays and minimise the need for follow-up with notifiers to obtain missing information or clarify things.
- Support may include:
  - clear and simple instructions – for example, clear written instructions with photos
  - training – face-to-face training facilitates two-way conversations and trust, particularly if it is tailored to the group involved. Online training can be delivered at low cost and people can do it when convenient for them

Example of clear instructions from the Pantry Blitz



- support staff – who notifiers can call with questions, feedback or issues. These could be paid staff, people in other positions who are willing to take on this role, or volunteers who have the right skill set and time available
- some mentoring – to ensure people are doing tasks correctly, for example:
  - ✓ experienced government vets helping less experienced vets to take unusual samples
  - ✓ visits from program staff to monitoring sites to ensure samples are collected correctly
  - ✓ sending reminders when monitoring is requested certain times of the year
  - ✓ where notifiers are asked to set up traps, asking them to send in a photo of the trap before monitoring begins to check that it has been set-up correctly
  - ✓ exposure to real-life examples of target species – to know what they look, feel, smell and/or behave like in real life. Make them available at face-to-face workshops or at a location where people can look at them. Vets could participate in overseas study tours to see animals infected with exotic diseases.

4.4.7 Deliver a positive reporting experience

- A positive reporting experience is vital to maintaining notifier support and it facilitates positive 'word of mouth' communication about the program.
- At the most basic level this includes being respectful to notifiers and ensuring the confidentiality of notifications.
- Other ways to deliver a positive reporting experience include:
  - prompt response to notifications, including feedback about what was found – consider having set timeframes to respond to notifiers
  - provide individual feedback – and consider adding interesting information about what was found for members of the community
  - being helpful and of value to those reaching out to the program and make them feel heard and valued for their effort and interest. For example, if they are concerned about a particular established pest, weed or disease assist them in getting information about managing it
  - be transparent about what is happening in response to their notification where possible, such as whether plants were seized
  - maintain a sense of achievement by reminding people that they are part of something bigger that is leading to positive outcomes (if true)
  - for programs that involve subsidies, ensure smooth government processes that will enable timely payment of claims.

For the NZ General Surveillance Program, prompt responses to notifications starts with the call centre picking-up 95% of calls within 20 seconds and clear and strict protocols to ensure the notification reaches the appropriate people in MPI promptly. Callers with a potentially significant detection often hear back from an MPI expert within the hour requesting further information.

4.4.8 Be agile and responsive

- Maintain momentum with engagement, respond to opportunities and issues as they arise.
- Design programs to minimise delays due to bureaucratic processes, such as by providing staff with some level of independence to enable them to capitalise on organic opportunities as they arise.

4.4.9 Engage with the broader context in mind

- Ensure where possible that the general surveillance program messaging is in line with broader biosecurity messaging.
- Consider including broader biosecurity messages where groups are well engaged, but take care not to overload notifiers.

4.5 Provide well-considered reporting avenues

- A range of reporting avenues are available to collect surveillance notifications.
- Choose avenues to best meet the program's and notifiers' needs. Consider the following:
  - the reporting tools (phone, email, app, etc.)
  - access to multiple tools helps accommodate notifiers' preferences in technology and human interaction, and can overcome connectivity challenges posed in remote locations (see Table 3)
  - the supporting information needed – such as photos, specimens, samples, etc.
  - any rules that apply to making notifications – for example, some animal disease notifications require a verbal conversation with the program coordinator before a significant disease investigation subsidy is approved.
- Some people are most comfortable making a notification through an informal discussion with a local/trusted expert (i.e. `trusted friendly face' – see 4.3). Ensure that anyone likely to fulfill this role knows how to formalise a notification through the program.
- Collect the same information across reporting avenues for easier data analysis (see 6.5.1).
- Below is an overview of considerations related to the main reporting tools, types of supporting material and information, and follow-up communication methods. Some of the advantages and challenges of each are listed in Table 3.

Tech solutions can over-promise but under-deliver

the challenge I find … [is] trying to engage with senior management or managers or decision makers who are wowed by these pretty, glistening, shiny things. They think that suddenly by adopting an app or engaging with a new platform that's going to solve everything. The reality is that there is often a big gap between what that technology can deliver and what's required from a biosecurity decision-making process. ***[Lab representative]***

Onerous paperwork hinders reporting

If you know you're going to have to sit down, go through a real bureaucratic process, filling out endless forms … in a busy vet's life it can be hard to find that time. Therefore, you can think, "Oh, I'll just manage this disease by myself, I won't even mention it [the subsidy] to the farmer". ***[Private vet]***

4.5.1 Reporting tools

- When designing reporting tools, consider what information is essential (see 6.5.1), use plain English and avoid ambiguity. If reporting is too onerous it will discourage notifiers (see 4.4.3).
- Consider collecting the minimum information with the initial report.
- Design reporting tools carefully to avoid adding to workloads elsewhere in the program, such as the need to follow-up with notifiers, manual data entry and data cleaning.
- Identify existing reporting tools that could be utilised, even as an additional reporting avenue, such as existing biosecurity hotlines.

Hotline/Dedicated phonelines

- Hotlines or dedicated phonelines are best answered by an assigned person/people with the appropriate training and/or expertise.
- A call centre is recommended to accommodate a high number of notifications. A dedicated personal phone number can be used when a small number of calls are expected.
- Aim for calls to be free or at very low cost (i.e. charged as a local call) to encourage reporting (see 4.4.3).
- Train and support staff responsible for answering calls, particularly if call centres are involved (see 2.6).
- Develop and resource procedures to support correct and timely direction of calls to appropriate team/experts, including arrangements for after office hours (e.g. call `flows' for call centres).
- Consider developing an intuitive computer-based system for staff to easily locate information, including about key pests, weeds and diseases.
- It can take months for a call centre to function well.
- Ensure the hotline is well-known and it is easy to find the number, for example, with an internet search.

Dedicated email addresses

- Appoint staff to monitor dedicated email addresses.
- Direct notifiers to a dedicated email address from relevant websites and/or print material, such as pamphlets and handbooks.

Applications (apps)

- Apps include both simple online forms available on websites and more complex software used on a mobile device (e.g. smart phone).
- Consider using them for both reporting and information provision, for example, by including functions that can help with pest, weed or disease identification.
- Consult wide with end-users to develop an effective app to meet various people's needs (see 6.2 and 6.5.1).
- Consider piggy-backing on existing apps to reduce competition and save resources.
- Allocate resources to update the app over time (see 2.4).

Wide testing helps app work for all

... it's really important to prototype and test functions so that they [lab staff, scientists and others] get to see and try it first ... there might be a lot of resistance to a feature or extra functionality ... because they think it will create more work for them. ... So being able to balance the different wants of those groups can be difficult, so that you have a system which works for everyone. In designing this [the administrator interface] I wanted to make it as easy as possible to quickly enter that ID information, but actually have it in a valuable structure so it could be used for various purposes. ***[MyPestGuide™ communication person]***

Developing the user interface

- To optimise the appeal of an app:
  - make completing a report easy and minimise the number of steps required. Consider self-populating fields such as time and location
  - co-design it early-on with representatives of intended users, including considering the demands of the environment that they operate in
  - remember that design includes tailoring its `look and feel' (colours, font sizes, screen orientation, etc.) and the language used
  - remain open-minded, avoid assumptions, ask many questions and be willing to learn when seeking design input from others
  - consider developing multiple interfaces if diverse groups are asked to use it.

Storage of data layers

- Increase the value of data by integrating them with other data layers, such as spatial data (see 6.5.4). Remember to adequately account for the storage space and protection of the additional data layers (see 6.4).

Developing the backend software

- Software supports the processing of notifications with other data layers and provides that information to data users.
- Consult closely with intended data users to meet their needs, such as being able to easily integrate the data with active surveillance data (see 6.5.4) and minimise inefficiencies, such as the need for data reformatting or cleaning (see 6.5.1).

4.5.2 Supporting material and information

- Supporting material and information is used to identify a pest, weed or disease or triage the risk that it poses prior to taking further action.

Sample and specimen submissions

- The needs of a program determine whether sample and specimen submissions are needed. For example:
  - in some programs they are always required, such as for livestock significant disease investigations
  - in some programs they are required under certain circumstances, typically to allow for accurate identification or diagnosis
  - sometimes they are discouraged, for example, to avoid transporting new and emerging weeds that may contribute to their spread; or to avoid overloading labs with non-target species (see 5.3).
- Consider if notifiers may benefit from training to ensure specimen and samples are taken and transported appropriately to reach the lab or herbarium in a good condition (see 5.4).
- Provide a form to capture the necessary background information to accompany sample and specimen submissions. Remember, forms that are too onerous too complete will discourage reporting.
- Submission should be at no or low cost to encourage reporting (see 4.4.3).

Photos

- Requesting photos is a popular approach, particularly for initial pest or weed identification to assist with triaging. A specimen can be requested if needed to enable a more accurate identification.
- Provide guidelines on to how to take quality photos, including what to photograph (such as what parts of a plant), and how to maximise the clarity such as focusing the shot and the best time of day to take it.

Video calls

- Video calls with notifiers at the time and on-location of the notifications enables real-time collection of visual information of the pests, weeds or disease symptoms. This enables a rapid triage of the risk, and because it is on-location and interactive, can achieve greater certainty in the initial identification/ diagnosis.
- They have been particularly useful for animal disease investigations.

4.5.3 Follow-up communication

- When notifications require additional information, the best method for follow-up communication will be influenced by the:
  - reporting tool used – it is easy to reply to an email or send a message via an app
  - personal preferences – people may be averse to answering phones from an unknown number
  - time available for follow-up – making individual phone calls can be time consuming
  - type of follow-up information required – for example, if photos are requested then an email or text message provides an easy way for notifiers to respond to the correct address or phone number, but if context information is needed then a phone conversation would enable easier questions and answers
  - perceived risk of an incursion – phone calls enable a rapid clarification and therefore response.
- Some considerations for the advantages and challenges of different follow-up communication methods are listed in Table 3.

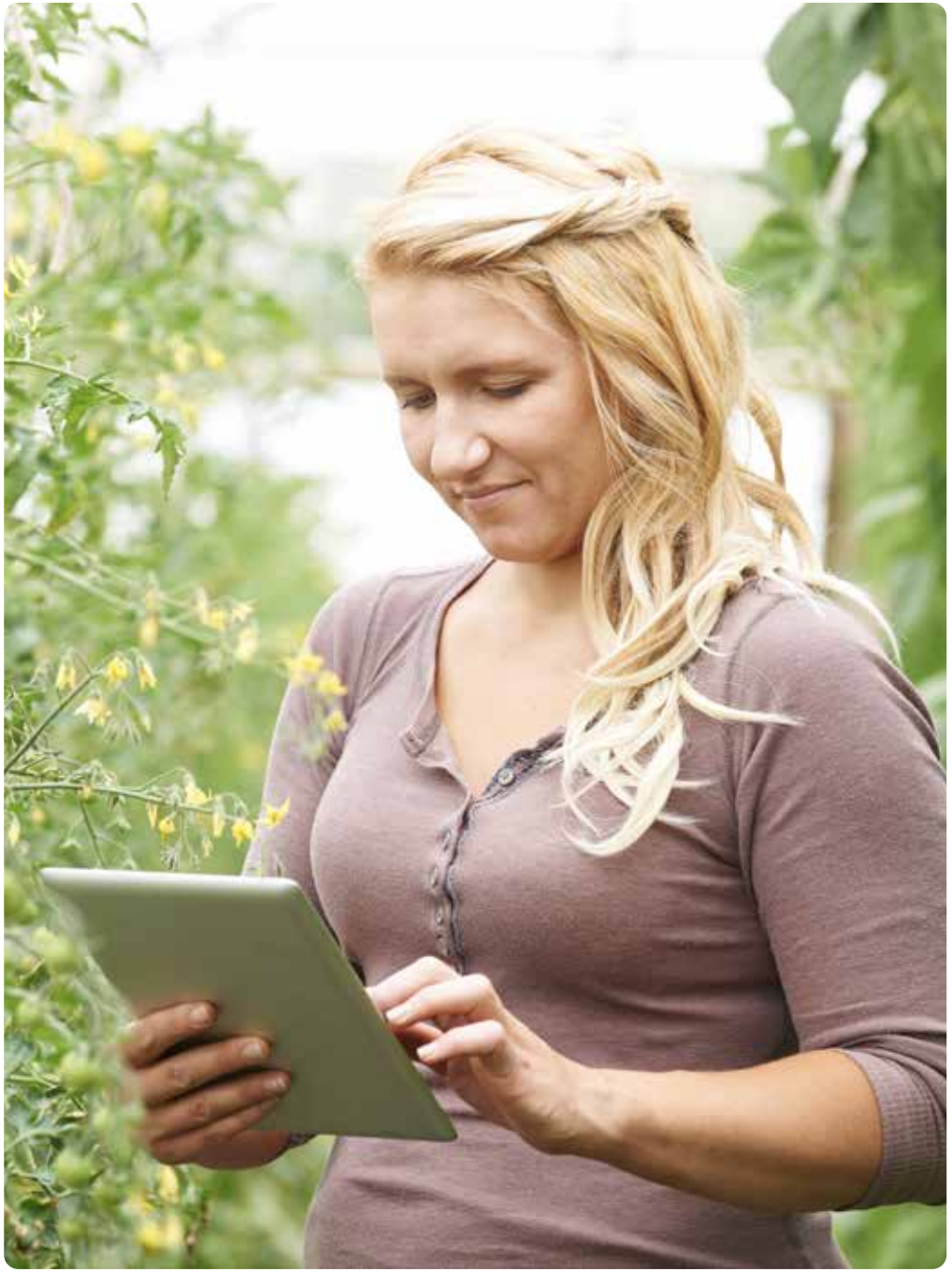


TABLE 3: Some advantages and challenges associated with popular tools and supporting material and information

	REPORTING TOOLS			SUPPORTING MATERIAL AND INFORMATION	
	Hotlines/dedicated phone numbers	**Dedicated email addresses**	**Applications**	**Samples & specimens**	**Photos**
ADVANTAGES	• Rapid and convenient if well resourced • Can help triage reports • Call centres can be cost-effective, available 24/7 and provide surge capacity • Could be 'one-stop-shop' if combined with other functions, e.g. compliance reporting or information provision • Dedicated phone numbers can support two-way communication and give personal touch • Easy to add or update instructions and change protocols	• Provides a direct report to the people who will address it (i.e. not reliant upon call centre flows) • Can include photos and maps • Provides a personal touch	• Easily accessible with smart phones • Can prompt for information needed • Date, time and location can be automatically collected • Geocoding of location can assist in later identification and management • Can minimise need for data cleaning • Feedback through the app can be done automatically • Can feature data standards to reduce need for data cleaning • Can feature automated processes, including focusing photos and data transfer, to minimise human error • Can use built-in artificial intelligence to triage notifications	• Allows for highly accurate identification and diagnostics • Samples can be preserved and added to collections • May allow for future re-identification if initial identification is in doubt • Builds a database for genotyping and isotopes	• Reduce need for field visits • Most people are comfortable with submitting photos • Triaging – photo indicates if a sample/specimen is needed • Could include location information • Builds a database for artificial intelligence
CHALLENGES	• Mobile reception in rural areas may be poor • Can be burdened by irrelevant calls • Association with the term hotline may create community expectation that someone will soon turn-up to check out the species/signs/symptoms **Call centre specific challenges:** • Some misdirection of calls is common • Takes months to function well • May have high staff turnover and variable staff capabilities • Strong accents may put callers off • Staff unfamiliar with commonly known local locations could frustrate callers • Requires manual entry of data	• Can be difficult to find location of sighting if the description is not adequate • Emails can be laborious to compile in the field on small devices • Poor internet connection in remote areas may inhibit reporting • Requires manual entry of data • Puts pressure on staff to be alert and responsive to incoming emails, often as part of other responsibilities • Hard to change email address if advertised in many media	• Some people may not be comfortable with using smart phones or computers • Can be expensive and labour intensive to develop and maintain • Too many apps available may be confusing to target groups • People might 'over report' because the process is easy • Internet connection in rural areas may be poor • GPS location can be interrupted by poor satellite coverage	• Risk of spreading a priority weed or disease if not collected and transported properly • Often requires skill to obtain quality specimen/sample • Poor quality hinders identification or diagnosis • May need to be accompanied with report or be associated with information collected previously • Manual entry of data • Sample preparation can be time consuming • Postage costs can be expensive • Space for storage of submissions may be a restriction	• Unsuitable for inconspicuous species • Poor quality photos hinder identification and burden identification team as it requires follow-up with notifier • Easy to snap photo and send, without including other relevant information

For video calls consider the advantages and challenges of Dedicated phone numbers and Photos

4.6 Incorporate legislative and other duty of care requirements

- Several external rules and regulations assist organisations to fulfil their duty of care to those who support general surveillance programs, such as notifiers.
- Other legal considerations include trespassing on private property and the prohibited collection of specimens from public land.
- The information below is to sensitise the reader to some key considerations, it does not constitute legal advice. It is important to seek legal advice for each general surveillance program.

4.6.1 Enlisting formal volunteers

- When enlisting people in a formal volunteer capacity consult the National Standards for Volunteer Involvement for formal guidance. It provides a best practice framework covering a range of issues.
- Establish program rules to protect the program and its volunteers depending on the requested tasks. These could include the need for volunteers to undergo a police check, complete a driving course, and follow a code of conduct.
- The legal requirements under a duty of care may be simplified by recruiting people as 'notifiers' or 'collectors', rather than as formal 'volunteers'.

4.6.2 Health and safety

- Identify the risks of injury to notifiers while they are supporting a general surveillance program. This can be done in consultation with notifier representatives using, for example, a risk assessment template such as a `job safety analysis' (Government of Western Australia).
- Lead organisations can adhere to their duty of care and avoid legal risk by:
  - being clear on their responsibilities under the applicable jurisdiction's work health and safety legislation
  - providing Safe Work Method Statements (SWMS) for hazardous activities such as driving or handling animals. Where possible, recommend against hazardous activities and give alternatives (e.g. submit a photo rather than collecting dangerous species or touching dead animals, wear protective clothing such as gloves)
  - providing training, guidance and initial in-field supervision
  - providing protective equipment if required and instructions on how to use it
  - when potentially hazardous samples are involved, such as submitting dead animal samples, reminding notifiers to package and label them appropriately to warn lab staff of the potential hazard
  - considering the desirable vaccinations of laboratory staff if they are likely to be handling hazardous samples.

4.6.3 Liability

- Consider if the lead or other organisations may be held liable if someone incurs costs while supporting a general surveillance program (e.g. when private cars and equipment are damaged, injury or allergic reactions cause medical expenditure, or trespassing result in legal costs).
- Strategies to prevent unwanted claims include:
  - being transparent about insurance. Some programs require volunteers to use personal insurance first, while additional insurance is available once an individual has exhausted all other avenues. Professionals, such as private vets, may be asked to hold public liability, professional indemnity and workers compensation insurance

- obtaining acceptance from notifiers in relation to disclaimers or indemnity, such as when people sign-up for the use of an app, or when professionals or businesses sign an agreement to participate in a program
- being pre-emptive and include liability issues in training and guidance documents
- covering liability of notifications by asking notifiers whether they had the necessary permission(s) to take the specimen, sample or photo. This could be done using an electronic or hard copy form when specimens are submitted
- if drones are used to take photos, ensuring that related rules are adhered to (see Drone rules – Civil Aviation Safety Authority (casa.gov.au))
- avoiding liability, for example, by having another organisation host training workshops.

- Where a grant is awarded to conduct general surveillance activities, conditions can be specified in the formal grant agreement to protect the funding organisation. This could include specifying that the grant receiver must:
  - hold public liability insurance to cover injury, damage and death
  - indemnify the funding organisation of any claims.
- Be mindful that this may be difficult if the grant receiver is a small group that struggles to have the necessary insurance.

4.6.4 Privacy and confidentiality

- Typically privacy applies to the rights of an individual and confidentiality applies to data to be free of public attention.
- Sensitive data are data that can be used to identify an individual, species, object, process, or location that introduces a risk of discrimination, harm, or unwanted attention (Australian National Data Service, 2018[1]).
- Take care when utilising privacy legislation because it may vary between jurisdictions.
- Ensure that the metadata (including personal details of notifiers) are collected, stored and accessed in accordance with privacy legislation, and seek legal advice to ensure legal requirements are being met.
- Inform notifiers of what information is being collected, why, what it will be used for, how it will be used (such as making detection locations publicly available) and who it will be given to, before asking for their consent.
- Many notifiers may wish to remain anonymous, particularly when they report something on private property.
- Some of the ways that general surveillance programs address privacy and confidentiality issues include:
  - seeking the needed permissions from notifiers when they sign-up to participate in the program or at the time of notification
  - asking notifiers to agree to make their reports and photos publicly available. However, the program team may wish to not publicly share photos that contain sensitive information such as expensive home equipment, children or pets, or features in photos that reveal the location, despite the permissions given
  - obscuring exact locations of detections when results are displayed on maps. However, this does not work well when large properties are involved as they may still be identifiable. Some programs liaise with all involved to find a compromise, such as grouping properties when displaying data to provide anonymity, but also enough detail for the information to be useful
  - not storing people's names and contact details in the notifications database or server
  - requiring approval from senior management (such as from the Chief Veterinary Officer or Chief Plant Protection Officer) for data to leave an organisation.

1 Australian National Data Service. (2018). Publishing and sharing sensitive data. ANDS Guides. Available at: http://www.ands.org.au/__data/assets/pdf_file/0010/489187/Sensitive-Data-Guide-2018.pdf

4.6.5 Intellectual property

- Intellectual property typically applies to items such as the photos, samples/specimens and data that notifiers provide.
- Consider which items that notifiers provide contain intellectual property and obtain their permission to use these for specific purposes.
- People often retain the ownership of photographs, but they permit the lead agency to use them for certain purposes.
- Ways to obtain permission include:
  - conditions of use for an app
  - terms and conditions listed online that people agree to, for example, by signing an online form when specimens/samples are submitted
  - requesting that the notifier assigns ownership of the item to the receiving agency.
- It is good practice to check with notifiers if they are comfortable with their photograph(s) or specimen/sample(s) being used in a way out of the ordinary, even if it is legally permitted to do so.

4.7 Further reading

- Alter, T., Driver, A., Frumento, P., Howard, T., Shufstall, B., & Whitmer, W. (2017). Community engagement for collective action: a handbook for practitioners. Invasive Animals CRC, Australia, available from community.invasives.com.au.
- Government of Western Australia. Job safety analysis (JSA), Department of Mines, Industry Regulation and Safety, commerce.wa.gov.au/publications/job-safety-analysis-jsa (accessed 7 Oct 2021).
- Kruger, H., Stenekes, N., Clarke, R., & Carr, A. (2010). Biosecurity engagement guidelines: practical advice for involving communities. Science for decision makers. Barton, ACT: Australian Government Bureau of Rural Sciences.
- National Biosecurity Engagement and Communication Framework, Australian Commonwealth Government. (2013). Available at agriculture.gov.au/sites/default/files/sitecollectiondocuments/animal-plant/pihc/bepwg/national-engagement-communication-framework.pdf.
- The National Standards for Volunteer Involvement, available at volunteeringaustralia.org/resources/national-standards-and-supporting-material/#/
- The Our Knowledge Our Way in Caring for Country Best Practice Guidelines, available at csiro.au/en/research/indigenous-science/Indigenous-knowledge/Our-Knowledge-Our-Way

5 Pest and weed identification and disease diagnosis

Key points

- The way pest and weed identification and disease diagnosis are undertaken is a key contributing factor to the trust that data users place on the quality of the general surveillance data.
- Balance the number of incoming notifications with the identification/diagnostic capacity to prevent staff from being overwhelmed.
- Identify ways to minimise the pressure on identification and diagnostic staff such as by maximising the quality of incoming notifications, on-going communication between the program engagement and identification/diagnostic teams; putting triaging processes in place and maximising the capacity of the identification/diagnostic team.
- Consider how data accuracy and timeliness during the identification/diagnostic process will be maximised.

5.1 Introduction

The way species identification and disease diagnostics are undertaken underpins the trust that data users place on general surveillance data. There is increasing investment in exploring, developing and using technologies such as artificial intelligence, or using DNA sequencing for environmental samples (eDNA). Such technologies could be used to automate all or part of the identification/diagnostic process, or to make them more convenient for lay people to use, such as rapid infield tests.

5.2 Consider how identification/ diagnosis is best undertaken

- Consider who and what technologies are available and most cost-effective to do the identification/diagnosis. Where 'proof of absence' is an objective, this also requires understanding the factors that impact the confidence in negative test results.
- Many programs use experts in government, universities or private facilities, such as labs or herbariums.
- Consider technological options, such as polymerase chain reaction (PCR) tests, eDNA and artificial intelligence, as they are playing an increasing role in this space. For example, some programs use technology, such as artificial intelligence or particular lures, to support the initial identifications and forward potential priority detections to experts for the conclusive identification.
- Identify with lab/herbarium staff what adjustments may be required from them to accommodate a general surveillance program, including updates to policies, procedures and/or equipment.
- Consider the impact of a general surveillance program on the workload of identification/diagnostic teams, including the complexity of their work. For example, there may be a need for staff rosters to keep track of follow-up processes with notifiers.

Lab staff's needs can be easily overlooked

People get carried away with the excitement of developing an extension program, push it out there in the media or through an industry group but they don't stop to think about who will actually go through all the notifications and how that side of it will work. ***[Lab staff member]***

- Consider if lab and herbarium staff may benefit from better understanding some contextual information. For example, knowing about detections made elsewhere that may inform what diagnostic test to undertake; or how to write reports that contain helpful practical insights, such as for vets.
- Many unknowns exist in pest and weed identification and disease diagnostics, particularly for environmental biosecurity.

5.3 Prevent labs from getting overwhelmed by notifications

- Prevent the number of incoming notifications from overwhelming the identification/diagnostic capacity; and prevent staff from spending an extraordinary amount of time on follow-up processes with notifiers to get adequate information.
- Consider detrimental feedback loops such as overwhelmed lab or herbarium staff being less able to fulfil functions such as providing timely feedback to notifiers or data users. This can affect the reputation of a program and contribute to notifiers or data users losing interest.
- Key ways to minimise these risks are discussed below.

5.3.1 Maximise the quality of incoming notifications

- Quality notifications refer to notifications that are within scope of a program, timely and that contain all needed information.
- Offer sufficient training and support to notifiers – to know what to look for (see 4.4.6).
- Target individuals or groups – who are well placed to spot and report particular pests, weeds and diseases, regardless of whether the programs are open for anyone (see 4.4.4). Just signing up anyone doesn't necessarily translate into more quality notifications.
- Develop tools to support quality notifications – for example, an app can provide users with instructions that minimise the need for follow-up, such as which parts of the plant to take photos of. Avoid tools that deliver 'just more blurry photos'.
- Provide feedback to notifiers about their notifications – to educate them about whether it was in or out of scope. This increases quality reports over time. Ensure it is done tactfully to not reduce the positive reporting experience of notifiers.

5.3.2 Put triage processes in place

- Triaging can occur at various points to filter out species that are out of scope before they reach the identification/diagnostic team. Examples include:
  - call centres – can ensure only valid calls are directed to the appropriate people. Calls of potential priority pests, weeds or diseases can be directed to particular people as a matter of urgency. The potential risk can also be gauged by asking background questions of the notifier such as 'Have you been overseas, interstate, near a shipping container or port?'
  - specially appointed people – can provide advice to notifiers on whether something is worth reporting. Examples include volunteer regional coordinators, biosecurity officers, industry body staff or specially appointed triage staff
  - internal risk assessments – labs may have their own triage systems determining which incoming notifications get priority. For example, risk classification can be based on where the detection was made (e.g. insects found in goods recently received from overseas are higher risk than those found in stored household grain products); or who made the notification (e.g. notifications from biosecurity experts carry more weight than a member from the public)
  - technology – some technologies, such as receiving images through apps, can assist identification/diagnostic staff decide whether a specimen or sample is required. Technologies such as eDNA can assist with flagging potential detections that warrant further investigation.

5.3.3 Maximise the capacity of identification/ diagnostic team

- Maintain on-going communication between program engagement and identification/diagnostic teams – to ensure that promotions or campaigns that encourage reporting fit in with their workloads.
- Minimise staff turnover – highly experienced staff are crucial to work through high notification volumes. Cultivate supportive and positive team environments, including professional development opportunities.
- Advocate for investment in new staff – allow for considerable training, mentoring and time to train new identification staff for a particular role as the number of professional identification experts (e.g. taxonomists, botanists, ecologists and zoologists) are declining.
- Free staff up from other responsibilities – so they can focus on doing identifications/diagnostics to meet program needs.
- Increase capabilities – train staff to be multi-skilled.
- Invest in technology – PCRs and eDNA and artificial intelligence can be invaluable in speeding-up identifications and diagnostics.
- Contract identification/diagnostics to third parties – when demand surges beyond the existing capacity.

5.4 Maintain specimen and sample quality

- Consider how specimens and samples need to be handled to prevent quality loss before they reach the people responsible for identification/diagnosis.
- Identify how specimens and samples are best chosen and/or prepared; how they need to be transported and stored; the pathways needed to reach the identification/diagnostic teams; and how specimens and samples are best retained.
- Considerations include:
  - guidance and/or hands-on training to prepare/take specimens/samples
  - temperature and time requirements – sometimes samples need to be kept cold or even frozen, others need to be tested within a certain time limit to ensure the result can be trusted
  - travel distances and the availability of courier networks, especially in remote areas
  - notifiers might need to carry the right equipment with them to store and transport specimens/samples
  - pathway(s) through large government departments to ensure specimens/samples reach the identification/diagnostic team in a reliable and timely fashion from the point where they are delivered
  - security and hygiene requirements to ensure that the biosecurity matter is not inappropriately stored or likely to spread.

5.5 Other considerations for data accuracy and timeliness

- Where relevant, ensure labs have the needed accreditation to undertake certain diagnostic tests, such as accreditation by the National Association of Testing Authorities under ISO17025.
- Put policies and procedures in place to support data accuracy and timeliness in labs and herbariums, for example, when something significant has been detected. Sometimes formal reporting avenues are spelled out in legislation.
- Other examples of policy and procedures include:
  - having fast track processes for priority pests, weeds or diseases – for example, call centre staff are trained to forward such notifications to particular experts. Lodging of specimens/samples of suspected priority species are fast-tracked and key people in the lab/herbarium and those responsible for response are notified
  - putting special arrangements in place to accommodate a surge of reports may necessitate additional appropriately skilled staff to confirm detections
  - using specimens/samples for important identifications rather than relying on photos
  - designing databases and reporting tools to select species names rather than typing them in to minimise human error
  - making double checking of important identifications/diagnoses a standard procedure
  - preserving specimens/samples to allow re-identification later if needed.

5.6 Further reading

- Pawson, S. M., Sullivan, J. J., & Grant, A. (2020). Expanding general surveillance of invasive species by integrating citizens as both observers and identifiers. Journal of Pest Science, 93(4), 1155-1166.

6 Data use, design and management

Key points

Data use

- General surveillance data can be used for a range of purposes. Consider how the demand for the data can be strengthened, including by sharing the data, as a greater demand may attract more financial and in-kind support.
- Maintain notifier support by ensuring they witness positive and valuable outcomes from the data that they contribute.
- Incorporate the preferences and requirements of key data users early in program design to maximise their use and trust in the data, including their capacity and capability to interrogate the data.

Approach to sampling

- Identify the objectives for the surveillance data.
- Consider factors such as specificity and sensitivity; risk pathways; potential biases; notifier distribution and efforts; maximising notification quality (i.e. timely, accurate and complete notifications); and balancing the required level of scientific integrity and allowing for flexibility in data collection.

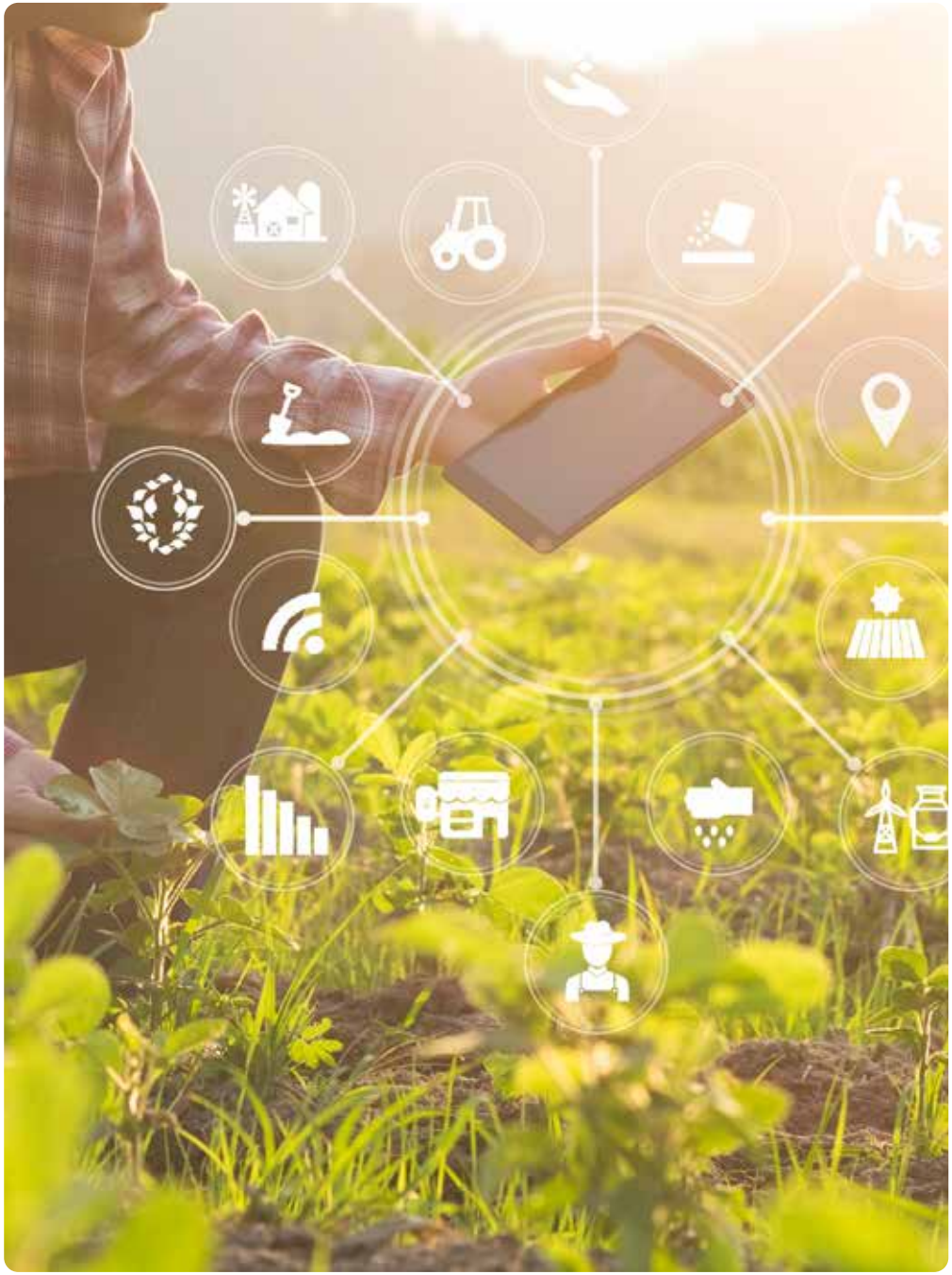
Data maintenance and analysis

- Consider data capture, flow and storage. Failure to do so can lead to inefficiencies, errors and security breaches.
- Think how to maximise value from the data, including integrating it with other data. Perhaps invest in powerful data analytic tools and analytic experts, ensuring they understand the context of the data collection (including biases) and the specifics of data use.
- Undertake a risk analysis of data flow to identify and manage risks. Consider data from the time of collection, the pathways (often involving various software, hardware, spreadsheets or databases) to the point of use. Identify points of vulnerability, such as manual transfer.
- Reduce the need to clean or reformat data as it takes staff time away from other functions (e.g. feedback to notifiers, data analysis).

6.1 Introduction

General surveillance data must be designed, collected, stored and analysed to meet the purpose of the program. This may include simple spreadsheets through to highly sophisticated statistical analysis and modelling.

Data include information collected and provided by notifiers, as well as metadata such as where and when a specimen was found and by who.



6.2 Ensure data use requirements are well defined

- Data users may be diverse because data from general surveillance programs can be used for a range of purposes (see 1.1.1).
- Use the program's key objective(s), scope (including the target species/disease(s) and areas/locations) and available resources to inform the approach to sampling (see 6.3), data collection and analysis.
- Consider secondary purposes for the data, such as the dissemination of information to interested parties (e.g. demonstrating worth to funding bodies (see 2.4.2), regular newsletters, creating alerts or delivering presentations) that may inform data collection and analyses.
- Collect and utilise the preferences and requirements of data users early in the program design to maximise the use and trust placed in the data.
- Ensure systems are in place to deliver timely action in response to the surveillance data and information.
- Establish clear expectations with notifiers and others involved with the program about how (format and content) and when (timing, how often, how soon after notification) feedback/data will be provided to them.

6.3 Consider the approach to sampling

- Sampling approaches in general surveillance vary from unstructured opportunistic searching (such as people being vigilant while being out and about and reporting any unusual or suspected sightings) through to being highly structured and prescriptive. See Figure 1 in Chapter 1.
- Consider the desired level of sensitivity and specificity needed for the purpose of the program.
- Consider the search effort required given the desired sensitivity of the program. For example, if there is a low probability of detecting a pest, weed or disease, aim to have a high number of people regularly looking for it.
- Consider the resources that will be required to collect enough information (see 2.4)
- Identify and address biases, gaps and redundancies in the data (geographically, over time and between species) by increasing the structure in the program (see Figure 1). For example, fortuitous find notifications are likely to be higher in popular national parks, during the warmer months (when more people are out and about) and/or for obvious species, so target monitoring activity to fill the gaps.
- Identify and plan for follow-up surveillance activities if a significant detection is made and ensure that the relevant arrangements are in place.
- For more structured programs develop protocols that define on-ground surveillance activities. Ideally involve relevant parties in their development, such as government and industry representatives.
- Adapt the approach to sampling when necessary, such as if the general surveillance program evolves because of new opportunities or changing objectives.
- Other key considerations are discussed below.

Sensitivity refers to the ability to detect a pest, weed or disease when it is present. It can either refer to the program level sensitivity, or to the sensitivity of an individual observation. **Specificity** relates to the extent to which dealing with out-of-scope species or pathogens is an issue.

Consider risk pathways for exotic, new and emerging species

- Target surveillance efforts to the risk pathways for the entrance and spread of target pests, weeds and diseases.
- Factors that increase risk include climatic and habitat conditions suitable for the target species, the presence of vectors and hosts, transport routes through which target species can hitchhike and natural means of dispersal (e.g. through wind, water or wild animals).

Adjust to the distribution of notifiers and their expected effort

- Notifier activity is not necessarily aligned well with where search effort is needed and may cause biases of where detections are made, such as:
  - the reporting of fortuitous finds that correlates with human population. For example, some surveillance blitzes have received stronger support in metropolitan rather than rural areas, or private vets may not service all regions in need of surveillance so government staff may need to fill the gaps
  - the monitoring of certain pests, weeds or diseases require specialised skills that are scarce, for example, there is a shortage of poultry vets in some areas
  - some people's willingness to do monitoring may relate only to areas or species that they value.
- Provide incentives to target notifier efforts. For example, offer a scaled subsidy to notifiers based on the importance of their find, such as private vets being offered a larger subsidy for disease investigations if they report a potential high risk disease.
- Target notifiers to fill gaps in distribution. For example, run notifier recruitment drives in under-represented areas or incentivise notifiers to survey under-represented areas.

Manage trade-offs between data collection requirements and scientific integrity

- Adapting to the needs of notifiers is important to keep them engaged, but it has to be balanced with the need for consistency in data collection and reporting, to ensure the information is of high quality and has an acceptable level of scientific integrity. For example:
  - some programs are flexible with monitoring locations to meet notifier needs, such as the placement of arrays that collect biofouling in ports, or vets monitoring disease while visiting their routine clients. Consistency comes from notifiers using the same methodology, i.e. port marine biofouling arrays are deployed at consistent times and seasons; and vets are trained to use the same sampling methods and samples are analysed in the lab using consistent methods.
  - some programs have one person to provide notifiers with support and advice, which contributes to achieving consistency between cases and, in some programs, across jurisdictions.
- Balancing notifier engagement and scientific integrity is often achieved through generating a shared understanding between notifiers and program staff. This can be done in group meetings or from program staff visiting notifiers, where different perspectives are discussed.
- Consider the trade-off between the volume of data collected and how useful it is. Larger volumes of data can provide more information but will require more time for analysis and `space' for storage.

Data management and use in Weed Spotters Victoria

The Weed Spotters Victoria program is primarily used to detect State Prohibited Weeds. However, data are also analysed to provide an annual report to Agriculture Victoria on program performance, with statistics such as the total number of notifications, the number of notifications by trained weed spotters, and the accuracy of notifications. They use data on the distribution of trained weed spotters and their expertise to target training and recruitment, and fill the monitoring gaps. The program coordinator manages the program's two databases, one containing the weed spotter contact data (i.e. metadata) and the other details of the notifications and follow-up management. They triage notifications and do the statistical analysis and reporting, so they have a thorough understanding of the program, the data and its context.

6.4 Consider data capture, flow, storage and value

- Most general surveillance programs utilise several databases across organisations/divisions, which are managed by different administrators/teams.
- Design an efficient data management system to avoid wasting time cleaning or collecting better data, fixing errors, and risk getting a poor reputation. Inefficiencies can drain resources (e.g. staff time reformatting data) from other program functions (e.g. notifier feedback or data analysis).
- Often a program's IT needs have to be integrated with an existing IT system, including an organisation's capacity and capability. Consider this early-on to minimise inefficiencies and maximise the value derived from the data.
- Ensure several people have an in-depth understanding of sizeable and complex databases to reduce the risk of losing that knowledge. Clearly document instructions on database use and do in-depth handovers when staff leave.

6.4.1 Data capture

- Optimise the capture of quality data. Do this with:
  - effective notifier engagement (see 4.4). Providing training and other forms of support will equip notifiers to make quality notifications (see 4.4.6)
  - carefully designed reporting tools to minimise the need for manual data entry and reformatting (see 4.5). Avoid using hand-written forms because legibility may present problems
  - triage systems that can filter out notifications of non-target species (i.e. out of scope or of lesser significance) and carefully validate the accuracy of other notifications
  - data standards to maintain consistency between notifications and between all who enter data. Data harvesting techniques may reduce the reliance on data standards for ongoing analysis
  - software for automatic checks when making electronic notifications (e.g. email address formats, detections are within geographic boundaries)

- minimal use of free-text fields by including online forms and drop-down menus to ensure standardised entries
- strategies to support specificity, such as pairing notifiers to support each other, or letting notifiers self-rate their expertise.

- Consider what information needs to be captured and the minimum data standards to ensure consistency and accuracy of data recording. Keep in mind that requesting too much from notifiers is a key disincentive for participation. Basic information to collect could include:
  - date and time
  - contact details of the notifier
  - suspected pest/weed/disease
  - the species affected (by disease) and/or host, if applicable
  - the location of the detection or where the sample or specimen was removed from. Does it require a GPS location, a paddock, postcode, key landmarks, roads/streets to help finding it again?
  - indication of prevalence or absence, e.g. how many animals show similar signs, how many weeds or pests were seen?
  - additional notes, photos or specimen(s) for identification and diagnosis, such as differential diagnosis in livestock that may inform which tests need to be prioritised
  - zeros – is there a need to capture and store nil detections, such as for market access requirements? When capturing zeros, remember the importance of training to minimise the chance of missing notifications due to inexperience, and note the difference between zeros and not available (N/A) data. Collecting zeros may be expensive but the benefits can be valuable.

6.4.2 Data flow

- Data flow refers to the transfer of data from the point of collection through various software and hardware to the point(s) of use. It may be stored at various points. Data sharing forms part of the data flow, referring to the practices, technologies, cultural elements and legal frameworks in the transactions of digital information between different organisations (eudatasharing.eu/what-data-sharing).
- Ensure that privacy requirements are upheld as data move between databases, such as before sharing data with stakeholders and the public (see 4.6.4).
- Undertake a risk analysis of the data flow to ensure risks, such as human, process or technological issues affecting data quality or flow efficiencies, are identified and managed.
  - Consider how and where data flow to identify opportunities for increased efficiencies and/or to minimise vulnerabilities to ensure data reach the desired database or audience(s) in a timely and useful form. For example, encourage lab staff to record data electronically, as this will improve the efficiency of the data flow.
  - Ensure systems are in place to minimise the risk of error, such as manual transfer resulting in incomplete or incorrect data.
  - Draw flow diagrams showing data flows to help understand and communicate weak points, improvement opportunities and the people/teams involved in the process.
  - Be mindful that the timing of incoming data may not align with reporting requirements – there is often pressure for prompt reporting to key stakeholders, but sometimes there may, for example, be a lag due to a delayed diagnosis.
- Carefully manage data migrations to new platforms – ensure IT staff understand the complexity of the data and the connections between different databases.

6.4.3 Data storage

- General surveillance programs can rapidly generate large data sets and data are often stored over long periods of time.
- Data stored within Australia are protected under national legislation. There might be less protections and control if data are stored outside of Australia. Consequently, overseas authorities might become aware of a potential sensitive detection in Australia before Australian authorities do.
- Consider how different kinds of data will be stored (i.e. metadata such as notifiers' personal data, contextual data for reports, photos and detections, and physical samples and specimens).

Carefully design the database(s)

- Consider spending time developing a schema with designers, programmers, analysts, users and notifiers. Considerations for database design include:
  - the needs of notifiers so they have a positive user experience
  - the skill set of the database managers and analysts. Technically complex databases require persons with specialist expertise to administer and query them
  - appropriate mandatory and optional fields to meet the goals of the program
  - the ability to class the quality of the data after validation
  - a system that enables appropriate user access and administrator rights, adhering to privacy requirements (see 4.6.4) and under which circumstances. For example, the database could have participant administrators who can manage memberships of certain groups contributing to it
  - links with other databases, such as taxa lists, to ensure correct scientific names are used
  - automatic alerts if certain detections (species and location) have been made
  - ease of downloading data that is in an accessible format to be used in other applications
  - the training needs for those who will be expected to use the database
  - the use of application programming interfaces (APIs) to enable the sharing of data between databases, apps and organisations
  - the ability to update data entry fields over time, such as including the different requirements for new pests, weeds and diseases.
- Aim for simplicity and avoid over-engineering a database.

Accommodate the data load

- Consider if existing systems can accommodate the general surveillance data and what alternatives are available, including:
  - space – if an IT system does not have the capacity for a high load of photos, consider using a separate system or triage the load
  - sudden influxes – such as during peak reporting periods or during a blitz. Triaging might help manage the load.
- Ensure data back-up systems are in place if servers fail. Programs collecting a large amount of data in short periods of time, such as a blitz, may wish to back-up data in shorter intervals than usual during these periods.

Avoid 'cluttered' databases

- Remove names and contact details of notifiers who no longer actively support the program as they can give a false impression of the number of people participating in the program and may waste resources if mailouts are involved.

6.4.4 Data analysis and value

- Better enable data analysis, availability and sharing by utilising the FAIR data principles (Findable, Accessible, Interoperable, Reusable) (Wilkinson et al 2016, ANDS website).
- Ensure data analysts have a thorough understanding of the data, the context and potential biases to enable sound inferences.
- Adequately resource data analysis capability to ensure the appropriate sophisticated methods and models are used to make sound inferences. Specific statistical techniques can be used to address certain biases, but the details of this is outside the scope of these Guidelines.
- Consider integrating surveillance and supplementary data (e.g. climate, soil types, the spread of vectors, human population densities). This can be used to model pest, weed and disease spread, or inform the correlation between the location of notifiers and likely detections and subsequent engagement activities.
- Consider how the demand for the data can be strengthened as a greater demand is likely to attract more investment (financially and in-kind) for data collection, and increase the positive outcomes achieved from the data.
- Where possible, share data to increase its value. For example, wildlife health surveillance information could be of value to animal health, public health and conservation agencies. Data could be shared by making the data publicly available on the internet, utilising existing databases or repositories such as the Atlas of Living Australia, iNaturalist, FeralScan and state/territory-based databases. Remember to adhere to privacy and confidentiality requirements (see 4.6.4).

Data analysis tools

- Invest in user-friendly data analysis tools, such as PowerBI or Tableau, to support interactive visualisations, reports and dashboards that can be interrogated by less experienced stakeholders. This may allow for real-time analysis and simulation of a smaller data set, rather than needing to store vast quantities of processed data.
- When choosing software to access and analyse data consider:
  - the information needs of different data users – including the potential for displaying data on maps and the development of graphs and diagrams
  - licence costs and conditions – some data analysis packages require individual user licences, which can complicate data sharing if others do not have licences
  - the technical support and documentation that are available as part of the licence
  - skills and capabilities – some products require more skills and specialised training to use and can therefore hinder wide uptake and use.

6.5 Further reading

- Caley, P., Kuhnert, P., Cox, S., Fiedler, K., & Barry, S. (2019). General surveillance data and analysis specifications -- Final Report. CSIRO Data 61
- Callaghan, C. T., Rowley, J. J., Cornwell, W. K., Poore, A. G., & Major, R. E. (2019). Improving big citizen science data: moving beyond haphazard sampling. *PLoS biology*, 17(6), e3000357.
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- Sergeant, E.S.G. (2018). Epitools Epidemiological Calculators. Ausvet. Available: http://epitools.ausvet.com.au.
- Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J., Appleton, G., Axton, M., Baak, A., ... & Mons, B. (2016). The FAIR Guiding Principles for scientific data management and stewardship. *Scientific data*, 3(1), 1-9.

Useful websites

- Australian National Data Service (ANDS), The FAIR data principles; The FAIR data principles – ANDS
- Department of the Prime Minister and Cabinet's `Best practice guide to applying data sharing principles' (pmc.gov.au)
- Epitools – (ausvet.com.au)
- iNaturalist A Community for Naturalists – iNaturalist
- The Atlas of Living Australia: Atlas of Living Australia – Open access to Australia's biodiversity data (ala.org.au)
- The open data toolkit

7 Continual improvement

Key points

- Design general surveillance programs to be responsive to challenges and opportunities. Monitoring and evaluation processes assist with identifying how to spend scarce resources.
- Undertake risk management and contingency planning to be prepared for the most likely and/or severe adverse events.
- Identify and monitor the key feedback loops within a general surveillance program to prevent weaknesses in one part of the program affecting other parts.
- Identify and monitor the most limiting factors in a general surveillance program to inform management and investment decisions.
- Identify leverage points as they can be catalysts for increased success and sustainability. For example, revised legislation can make the program mutually beneficial for key contributors, and look for investment opportunities in technology.

7.1 Introduction

General surveillance programs will inevitably encounter challenges and inefficiencies, or new opportunities may arise. Part of program management (chapter 2) is the need to monitor program performance to ensure the program adapts and evolves as needed to ensure its longevity.

Trust catalyses improvements

... we really try to push the science through in terms of the diagnostic approach that ... taking a leap to doing molecular diagnostics ... Because we had that collaboration and support from the ports, they were willing to take that leap with us ... I think it really helped with that transition. ***[SWASP representative]***

Principles supporting continual improvement

- Appoint an effective coordinator (or team) to remain in contact with key stakeholders and stay abreast and responsive to issues and opportunities, including new scientific developments.
- Be open to change and be responsive to changes in the operating environment, including identifying them in advance to act proactively.
- Have a 'growth mindset' by asking continually how the program can be improved and by welcoming discussions about program improvements.
- Allow for flexibility in how programs are run to allow for adjustments.
- Allow for some risk-taking and if something does not work out as hoped, see it as a lesson learned rather than a failure.
- Be agile, that is, allow the program team a level of autonomy so they can quickly respond to opportunities or issues without being tied down by bureaucratic requirements, such as lengthy approval processes.
- Allow enough time to build and maintain relationships and to have time available to monitor aspects of the program. Enlisting suitably skilled consultants to undertake surveys and interviews can be valuable.
- Allow enough time and resources for implementing changes, such as to test changes to an app, or test whether target groups interpret new communication or training materials as intended. This may include implementing small trials first.
- Enable on-ground information to reach the program team and other stakeholders, such as scientists and policy-makers. For example, remain in contact with people who are in touch with notifiers; organise forums for notifiers to meet with other stakeholders; or arrange visits for program team members to do on-ground visits.

7.2 Embed monitoring and evaluation in the program

- Monitoring and evaluation assists with informing how to best allocate scarce resources.
- Develop a monitoring and evaluation plan. Examples of approaches are provided in the Further reading section (see 7.5).
- Other considerations for strengthening monitoring and evaluation include:
  - identify a vision statement (what does success look like?)
  - establish baseline information as benchmarks and set milestones and targets to guide and measure performance towards the vision statement. For example, it could include timely responses to notifiers, targets for notifier numbers and distribution, and number and quality of notifications received (e.g. quality targets could include the number of notifications received versus the number of investigations opened; or the number of inadequate notifications that required follow-up, etc.)
  - invest in monitoring notifier performance, such as surveys or interviews about their confidence to recognise priority pests, weeds or diseases (this may differ between species) and how valuable they find certain forms of support, such as training sessions or materials
  - meet regularly with people representing the different parts of the program – to stay abreast of the issues and opportunities that they face
  - invest in program reviews – to enable an in-depth exploration of the program to identify opportunities for improvement
  - enlist support from suitably skilled consultants – for example, to do a stakeholder needs analysis or seeking feedback from key stakeholders about how the program can be improved
  - undertake regular team reflections on program performance and be willing to make changes as needed.
- Be mindful:
  - to not over survey people
  - that spokespeople, e.g. for an industry group, may not necessarily represent the views of the silent majority.
- Ensure lessons learned are communicated to the relevant people (i.e. working in particular functions) throughout the system.

7.3 Actively manage risk

- Do a risk assessment at the start of the program and at various times throughout. While not all risks can be foreseen, a risk analysis can assist with being better equipped to address adverse circumstances.
- Prioritise risks based on the likelihood each of them may happen and the consequences if they occur. Consider potential feedback loops (see 7.4.1). Put measures in place starting with risks of the highest priority.
- Undertake contingency planning to be prepared for the most likely and severe adverse events.

Not all activities pan out to be worth it

It is actually worth investing in the future on an ongoing basis. So to do that you need to be able to evaluate at certain points, what you're doing is actually worthwhile. ***[Program coordinator]***

7.4 Interactions to look out for

- Three systems thinking concepts are helpful for continual improvement, i.e. feedback loops, the most limiting factor and leverage points.

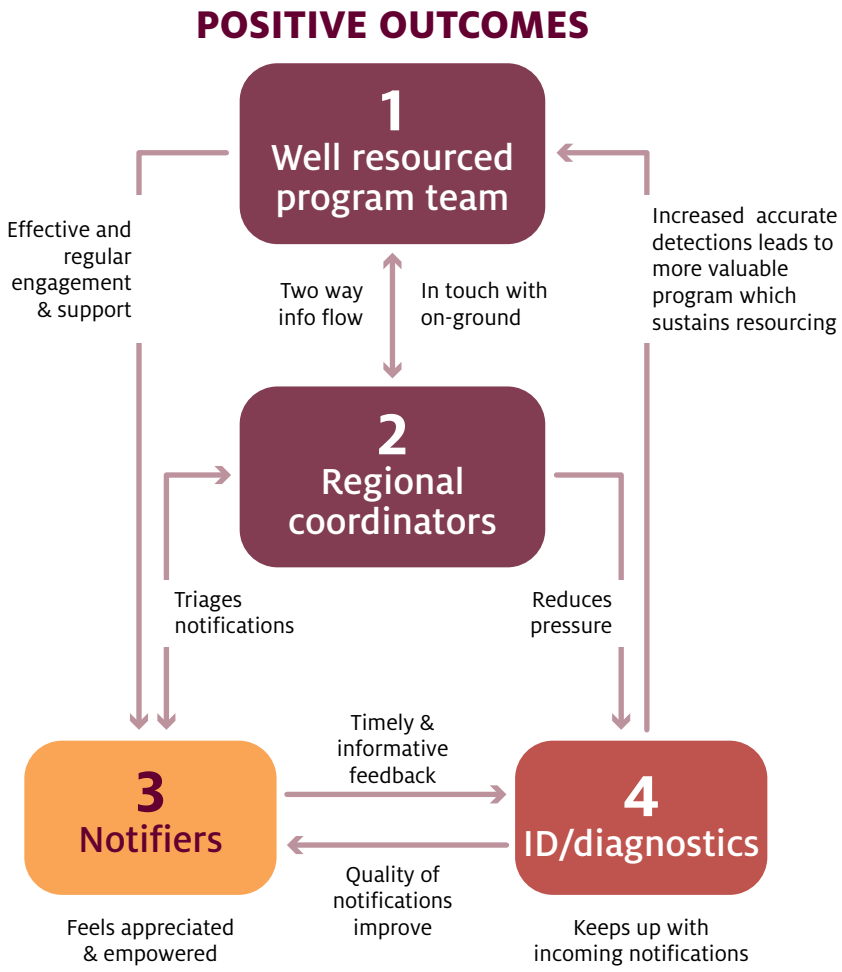
7.4.1 Identify feedback loops

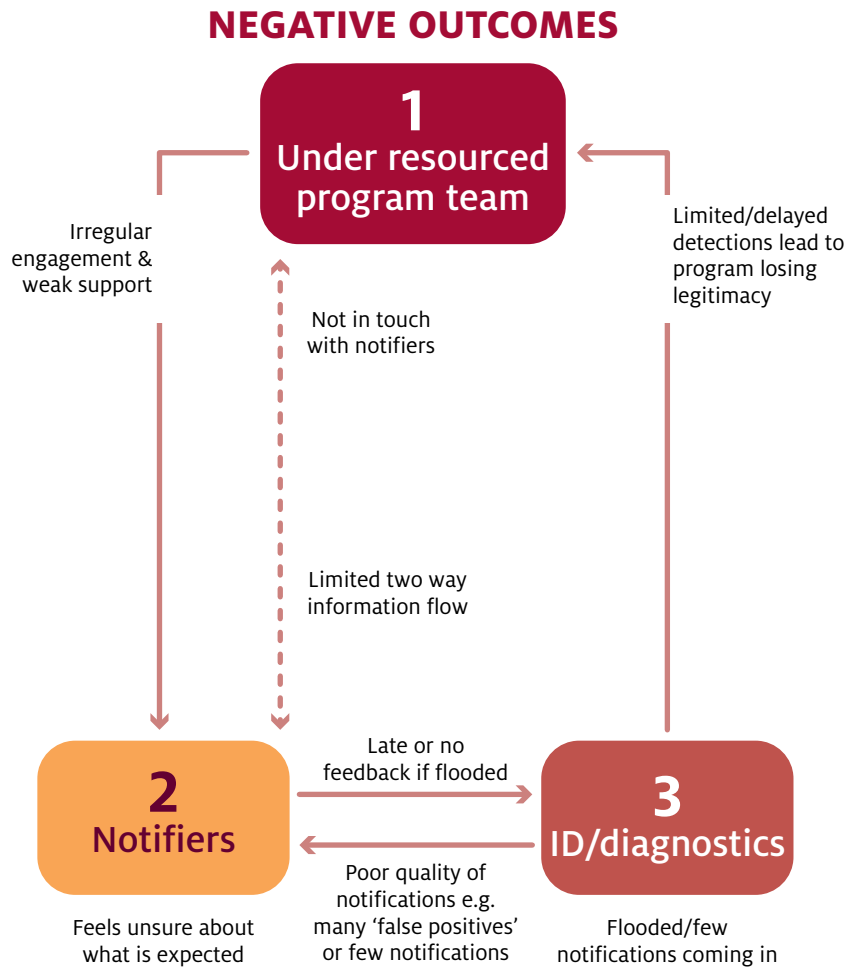
- Feedback effects happen in general surveillance programs when change in one part of the program impacts another. Examples include:
  - communicating with stakeholders builds rapport, trust and relationships thereby maintaining their support for the program
  - an increase in notifiers causes an increase in the number of notifications a lab needs to service
  - a decrease in data analysis causes a decrease in data value to various stakeholders
  - an increase in temperature may decrease the prevalence of certain pests, weeds and diseases
  - an increase in notifier training decreases the number of species or pathogens that are out of scope reaching the lab or herbarium.
- Identify the most likely feedback loops and monitor them to prevent potentially detrimental outcomes and build potentially beneficial ones.

Delayed feedback

Some feedback effects may take time to realise, called delayed feedback. Once the effects occur the origin may not be apparent. For example, the effects of introducing more demanding notifier requirements, such as onerous paperwork, are not likely to show immediately. The notifier database may suggest for a long time that the program has much support. Fewer notifications than expected may be attributed to not having enough notifiers, or notifiers not finding anything to report.

FIGURE 4: Examples of feedback loops as a result of the effectiveness of program coordination





(1) A program team is resourced to deliver effective and regular engagement and support to notifiers. **(2)** A network of volunteer regional coordinators also support notifiers and let them know if something is worth reporting. Regional coordinators relay information from the on-ground level to the program team, enabling the team to be responsive to on-ground issues or opportunities. **(3)** Notifiers feel appreciated and empowered, which equips them to make quality notifications. **(4)** The identification team can keep up with incoming notifications (rather than being flooded by out-of-scope species) and give timely and interesting feedback to notifiers, which again makes notifiers feel appreciated and empowered. Through quality notifications and quick identification the program delivers valuable data and important detections that help sustain funding **(1)**.

(1) An under-resourced program team delivers weak notifier engagement and support, which results in many **(2)** notifiers being unsure about what is expected. Without the support of regional coordinators, initially there is an increase in out-of-scope species that the **(3)** identification team needs to deal with. If notifiers are enthusiastic it can flood the capacity of the identification team, which results in late or no feedback to notifiers. Notifiers lose interest in the program due to a lack of a positive experience, which discourages them from making notifications. Overall, the program delivers limited or delayed detections, which undermines continued funding support for the **(1)** program.

7.4.2 Identify the most limiting factor(s)

- The variable(s) that are most limiting in a program is the most important to bring about progress.
- Identify the most limiting factors (and if possible their likely thresholds) to know where to best invest to strengthen a program and what to maintain to prevent deterioration. Examples include:
  - staff resources – other than appointing more staff, free up existing staff, such as by enabling them to focus on key tasks only; investing in technology (e.g. in labs to speed-up identification/diagnostics); or designing better processes or reporting tools (see 4.5.1) (e.g. to minimise the need for data cleaning). Recognise and reward good staff performance
  - notifications – identify what causes a lack of notifications. For example, more awareness-raising may be of little use if too onerous reporting requirements are discouraging notifications
  - data – investing in more data collection to answer certain questions may fall short if the database is difficult to interrogate or if there is limited staff capacity and data analysis tools to undertake in-depth data analysis.

7.4.3 Identify leverage points

- Leverage points involve a small shift in one area delivering considerable beneficial change in another area(s) or to a general surveillance program as a whole.
- A key leverage point is a shift in the mindset in which a general surveillance program is embedded. Examples include allowing for a greater focus on prevention (including early detection) than mainly managing pests, weeds and diseases; or being open to doing things differently than have been done traditionally. Other examples of leverage points are listed below.

Advocate for enabling legislation

- Biosecurity legislation can strengthen the legitimacy and importance of a general surveillance program in various ways, for example by:
  - strengthening communication requirements between key stakeholder groups when there has been a significant detection
  - increasing demand for the program's services, such as weed identification training to key players, such as local governments, if they have related responsibilities under legislation. This can strengthen the relationships between the program and key stakeholders
  - increasing funding for general surveillance.

Make the program mutually beneficial for key stakeholders

- Avoid silo-ed thinking - it can easily happen as a result of resource pressures that force government and other teams to focus on their own priorities and core business only.
- Be aware that stakeholders' primary aims and needs seldom completely line-up with government goals, for example:
  - farmers may be less interested in exotic pests, weeds and diseases that are not affecting their production as opposed to established species that are causing damage or are costly to manage
  - gardening groups are more interested in learning about how to grow flourishing vegetables and ornamental plants rather than monitoring for new and emerging pests and diseases
  - private businesses, such as vets and on-farm consultants, primarily must run profitable and successful enterprises. Spending considerable time and money collecting samples to support evidence of disease freedom may not obviously contribute to these goals.

- Consider how the program can assist key stakeholders to achieve their goals or fulfil key needs. It can be transformational in getting support and achieving program resilience, for example:
  - some private businesses and government entities, such as ports, have legislative requirements to show environmental stewardship. Technologies such as eDNA can enable the collection of biodiversity data relatively easily and at low cost and can assist them to demonstrate care for the environment
  - several livestock general surveillance programs instigated to collect data to support claims of freedom of exotic diseases, also subsidise the diagnosis of other significant diseases. Few producers would pay towards testing for an exotic disease only, but they are more likely to co-invest if they may find out what makes their animals sick. These subsidies help private vets to deliver a better service to their clients.

Invest in technology

- Advocate for technology that delivers more and/or quicker identifications/diagnostics, such as PCRs and eDNA. Benefits include:
  - lab or herbarium staff are better able to cope with influxes
  - experts such as entomologists, taxonomists, etc. can be freed-up from routine work to focus more on rare identifications
  - quicker response times to notifiers about what they have found contributes to providing positive reporting experiences
  - stronger evidence in a market access context if identification/diagnostics are more accurate.
- Automate data flow to avoid cost related to manually entering data or written reports.
- Avoid all investment being allocated to technological improvements at the expense of addressing other limiting factors.

7.5 Further reading

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- Muellner, P., Watts, J., Bingham, P., Bullians, M., Gould, B., Pande, A., ... & Stärk, K. D. (2018). SurF: an innovative framework in biosecurity and animal health surveillance evaluation. Transboundary and emerging diseases, 65(6), 1545-1552. Available at: https://onlinelibrary.wiley.com/doi/full/10.1111/tbed.12898

8 An enabling environment

Key points

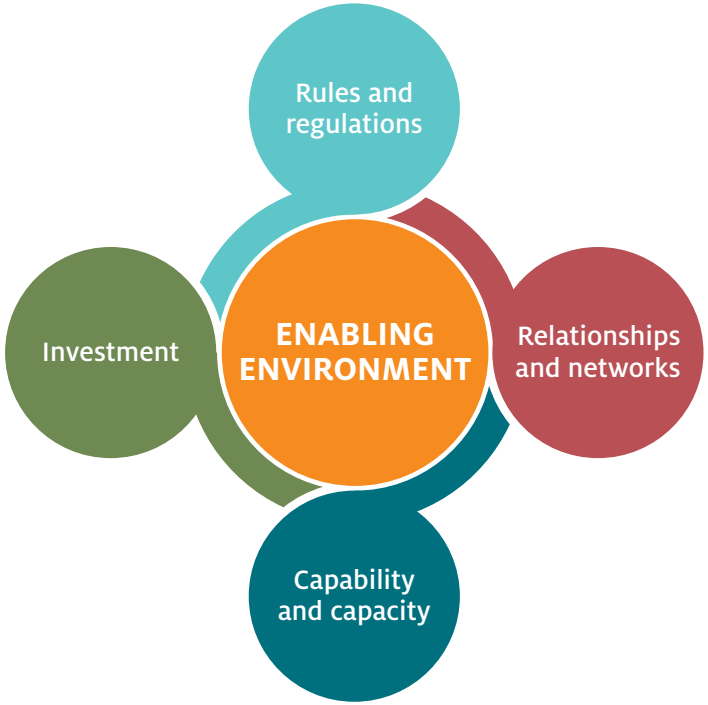
- The broader operating environment could either enable or hinder a general surveillance program. An operating environment might include rules and regulations governing programs, relationships and networks, investment, capability and capacity.
- Rules and regulations that influence people's behaviour can range from formal requirements (e.g. legislation), to semi-formal practices (e.g. organisational strategic plans) to informal habits (e.g. culture and norms).
- Embed a general surveillance program in existing rules and regulations to increase its legitimacy, for example:
  - align with relevant international rules, biosecurity arrangements, organisational strategic plans and other external regulations
  - assist stakeholders to fulfil their legislative requirements (e.g. being the easiest way to undertake mandatory reporting requirements).
- Influence the broader environment such that it supports and complements general surveillance programs.
  - Influence legislative reviews.
  - Advocate for broader initiatives that foster trust-based relationships and networks between stakeholders as these will facilitate learning, collaboration and cooperation.
  - Create awareness of the damaging effect that past events which caused strained relationships can have on general surveillance programs when they try to engage with the groups involved.
  - Advocate for a balance between educational approaches and enforcement using prosecution only once softer approaches failed.
  - Advocate for building capability and capacity to support general surveillance, such as investment in technologies and people's skills and abilities to levels that meet demand.
  - Advocate for adequate investment in general surveillance programs as well as related functions, such as response capacity.

8.1 Introduction

General surveillance programs are embedded in a broader environment that could enable or hinder various aspects of a program.

Four key interacting elements include rules and regulations; positive relationships, investment, and capability and capacity.

FIGURE 5: Four key interacting elements of an enabling environment



8.2 Broader rules and regulations

- Rules and regulations comprise a spectrum ranging from formal to informal rules that influence how people behave.
  - Formal rules include legislation and regulation.
  - Semi-formal include organisational plans, code of practices, and procedures.
  - Informal rules include values, norms and culture.

8.2.1 Align with rules and regulations

- Identify relevant international rules that drive the existence, or influence the design, of general surveillance programs.
  - Market access - the International Plant Protection Convention (IPPC) and the World Organisation for Animal Health (OIE) stipulate rules related to surveillance and these are the rules that the World Trade Organisation accepts to support international trade.
  - Biodiversity - the Convention on Biological Diversity (CBD) sets targets for biodiversity, including preventing or reducing the rate of invasive species' introduction and establishment.
  - One health – efforts to address zoonosis and antimicrobial resistance by better integrating animal and human health surveillance information and data, such as through the One Health Surveillance Codex.
- Consider embedding the program scope in legislative requirements, such as basing it on the list of prohibited and/or restricted species or notifiable diseases.
- Align a general surveillance program with existing biosecurity arrangements, such as management and response plans, and the strategic plans of the lead organisation to strengthen the legitimacy of the program.

- Comply with biosecurity related legislation and regulations, including requirements for:
  - permits to keep restricted or prohibited species for training purposes
  - hygiene protocols, for example, to transport state prohibited weeds
  - handling suspected notifiable animal diseases, for example only accredited labs are permitted to do such diagnoses.
- Comply with relevant external rules and regulations. Examples include aviation rules, such as those impacting the use of drones; requirements relating to transporting some samples, such as sensitive biological agents; or the safety and security rules on certain premises, such as at ports.

Legislation link sustains funding

... because we are linked through legislation it gives us a strong case and makes the funding more sustainable. ***[Weed Spotter Queensland Network interviewee]***

8.2.2 Support key stakeholders to comply with legislation

- In order to increase the relevance and support for a general surveillance program, design it to be helpful to key stakeholders to fulfil their responsibilities under legislation, for example by:
  - being the easiest and most cost-effective way to fulfil mandatory reporting requirements
  - offering training in species identification, such as for local government staff responsible for managing priority weeds.

8.2.3 Influence existing rules and regulations

- When biosecurity rules and regulations are reviewed, consider how they can be changed to support general surveillance programs, for example by:
  - providing powers to government staff to enter private property to investigate or if needed, confiscate material, when appropriate (e.g. when softer approaches have failed)
  - stipulating reporting requirements
  - setting requirements for information, records and data sharing for various stakeholders
  - enabling mechanisms to support community involvement, such as enabling levies from rate payers to support locally-driven general surveillance programs.

8.3 Relationships and networks

- Positive and productive relationships are key to maintaining trust and goodwill between stakeholders, such as governments, industries and communities. See 4.4 for a summary about the importance of trust. In short, positive trust-based relationships increase willingness to cooperate and collaborate, while a lack of trust can lead to increased cost related to the need for more negotiation, regulation and enforcement.
- Build on and advocate for broader initiatives that support positive stakeholder relationships and networks, such as:
  - broader biosecurity awareness and education campaigns that can assist with laying the foundation for general surveillance programs
  - co-designed agreements, such as the Government Industry Agreement in New Zealand that gives industry stronger influence during biosecurity responses
  - arrangements in case of an outbreak of a priority pest, weed or disease. Deeds or agreements in various sectors between the Australian Government, state and territory governments, and other signatories, such as industries, outline the arrangements for nationally coordinated responses and cost sharing before an outbreak happens
  - making information accessible to target groups, such as 'translating' legislative requirements into plain English.
- Create awareness among those implementing biosecurity and other functions that their actions have implications for subsequent engagement with the groups involved. For example, if government performed poorly during a response (e.g. being too heavy-handed or too slow to deliver compensation) it will complicate subsequent engagement with these groups.
- Encourage reviews of response actions and other initiatives that involved interaction with communities and stakeholder groups to understand the resulting positive and negative impacts. This can assist with addressing any detrimental impacts.

Ko Tātou This Is Us

New Zealand used a scaffolding approach in supporting biosecurity awareness and education of the broader public. They launched a campaign called Ko Tātou This Is Us of which the first phase aimed to build an emotional connection and baseline awareness by explaining to the public what biosecurity is and why it is important to them. Ko Tātou This Is Us recognises that it takes all New Zealanders to play their part in protecting New Zealand's outdoor environment. Subsequent campaigns, including those relating to general surveillance, build on the original campaign.

8.3.1 Strike a balance between softer educational approaches and enforcement

- Remind those with the powers to undertake enforcement that overly quick use of harsh approaches can have adverse effects, including:
  - creating fear of biosecurity authorities, which could deter further notifications
  - disengagement and even hostility
  - dumping of species of concern, such as weeds, which may contribute to their spread.
- People may not be aware that they are in possession of rohibited or restricted species, or they may underestimate the risk that these species pose.
- However, it is important that people see decisive action when biosecurity laws are violated to maintain the legitimacy of the relevant rules.

Harsh approaches discourage reporting

I, myself, have a philosophy of not being highly regulatory and jumping and closing stuff down. Especially where someone voluntarily put their hand up and says, "I've got a problem". My motto is, I would prefer to be three days late in knowing it was an EAD [emergency animal disease] than three weeks late [because people don't notify authorities].
[State/Territory Chief Veterinary Officer]

The Voluntary, Assisted, Directed and Enforced compliance model

In New Zealand, the Compliance and Governance branch of the Ministry for Primary Industries applies the **V**oluntary, **A**ssisted, **D**irected and **E**nforced compliance model (VADE model). The model recognises varying levels of behaviours which guide the approach to deliver interventions. The voluntary approach (V) recognises that most people comply voluntarily with rules and aims to ensure that the public is aware of certain rules and regulations. This is done through education programs and communication. In instances when the public are uninformed of sector specific regulations, the assisted (A) approach reminds those wanting to comply of their responsibilities and possible consequences. For those less willing to comply, the directed approach (D) guides an appropriate enforcement plan to deter or stop the behaviour. The enforced approach (E) targets those with a criminal intent and who are likely to undertake risky biosecurity activities using the full force of the law, if required.

8.4 Capability and capacity

- Be informed about national level approaches and contribute to the development of national level coordination related to general surveillance.
- Advocate for building capacity to support general surveillance by investing in:
  - enabling technologies, such as those related to pest, weed and disease identification and diagnostics; data management and analysis, reporting tools, etc.
  - people's abilities and skills to fulfil various functions relating to general surveillance
  - systems integration or connection of systems that work well to allow for nationalisation and prevent doubling-up between jurisdictions, such as effective reporting tools and data management systems.
- Advocate for strengthening capacity by investing in adequate levels of capability to meet the rising demand, such as the need for effective notifier engagement, quick and accurate identification and diagnosis, cost-effective data management and analysis, and responses to suspected incursions.

8.5 Resourcing

- General surveillance programs require significant and on-going resourcing to function well and sustainably (see 2.4).
- Advocate for adequate investment in general surveillance programs and related functions, such as maintaining positive relationships and response capacity to suspected incursions, otherwise general surveillance programs may lose legitimacy.
- Advocate for funding conditions that meet the need of new general surveillance programs, such as the need for flexibility when co-design processes are involved, and program plans and outcomes can not be clearly defined in advance.

Glossary

Term	Definition
active surveillance	Biosecurity surveillance carried out in a fully structured way, such as according to formal protocols, usually undertaken by paid staff from government or industry agencies
biosecurity	Managing risks to Australia's economy, environment and community of pests, weeds and diseases entering, emerging, establishing or spreading in Australia
call flow	The set of instructions that direct call centre staff (or people responding to calls to a dedicated phoneline) from the moment they answer the call until the end of the call, including what questions to ask, where to transfer the call to, and when escalating the call is needed
community	Often thought of as the people living in a local area. However, a community can also mean 'community of interest' where a group of people have something in common, such as a personal interest (e.g. gardening, sports), group affiliation (e.g. LandCare group) or industry membership (e.g. citrus growers or livestock producers)
containment	The application of measures in and around an infested area to prevent the spread of a pest, weed or disease
data flow	The transfer of data from the point of collection through various software and hardware to the point(s) of use. Data may also be stored at various points
data harvesting	The automated collection of online information in databases and websites
data sharing	The practices, technologies, cultural elements and legal frameworks in the transactions of digital information between organisations
differential diagnosis	The process of differentiating between more than one condition that share similar signs or symptoms
eDNA	Environmental DNA is DNA collected from environmental samples, such from sea or fresh water or soil containing DNA from a range of species
exotic pest, weed or disease	A pest, weed or disease not normally found in a country
general surveillance	Biosecurity surveillance activities that have one or more element(s) of opportunism, usually to broaden the coverage of surveillance and/or achieve more cost-effective biosecurity outcomes, on a spectrum ranging from fortuitous ad hoc detections to relatively highly structured activities, but excluding active surveillance
knowledge brokering	Organisations, groups or individuals that act as intermediaries between diverse groups to facilitate interaction, engagement and/or knowledge flow between them. Knowledge brokers often 'translate' information between groups to make it relevant to their context and by using language that will resonate with them
lab	Laboratory
notifier	A collective term that includes people who are involved in data collection (pest, weed and disease monitoring) and notifying or reporting them to a general surveillance program

Term	Definition
PCR	Polymerase chain reaction is a diagnostic technique that involves making many copies of a small part of DNA to help identify species, including pathogens
program logic	A program logic is a schematic that describes how a program (or project) is intended to work. It shows the intended causal links in a program by linking activities with outputs, intermediate impacts and longer-term outcomes, including the program vision. Program logic is ideally used at the project planning stage to allow stakeholders to articulate the desired program impacts and outcomes and how these will be achieved and eventually lead to the program vision
program team	The people responsible for designing, implementing and coordinating the general surveillance program. A program coordinator may lead the team
sensitivity (of sampling approach)	The ability to detect a target pest, weed or disease when it is present. It can either refer to the sensitivity of a program as a whole, or to the sensitivity of an individual (for example, the likelihood that a notifier will encounter a species of concern and know to report it)
sensitive data	information that must be protected against unauthorised disclosure, including those related to personal information (e.g. names and other details related to notifiers), biosecurity (e.g. unverified detections of exotic pests, weeds and diseases) and conservation (e.g. the location of threatened species)
specificity (of sampling approach)	The ability to correctly identify a target pest, weed or disease. If notifiers are equipped to identify pests, weeds or diseases with high specificity, it minimises the number of out-of-scope species or pathogens that people in the lab or herbarium need to deal with
stakeholder	Organisations, groups or individuals who have a potential interest or involvement in a general surveillance program. They typically include representatives of industry, government, community groups, local councils, scientists, data managers, local experts and opinion leaders. Sometimes a stakeholder may not recognise that they have influence over or an interest in a general surveillance program
systems thinking	A holistic approach to explore the components that make up a system and the interactions between them and the broader system (as opposed to more traditional approaches that focus on understanding each individual component only)
target group	The groups the notifier engagement strategy intends to influence. Notifier engagement target groups typically include—but are not restricted to—community members or groups; farmers; private businesses, including professional delivering on-farm services; and Indigenous communities. Target groups could also be or become stakeholders if the program objective is of interest to them
vet	Veterinarian