National Surveillance Plan for the Australian Grains Industry

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Contents

1.0 Executive summary and recommendations

The Australian grains industry is free from many pests that impact production and trade overseas. To continue to protect the grains industry from incursions of exotic pests, and to assist prepare the industry for potential new incursions of exotic pests, the Grains Industry Biosecurity Plan (IBP) was developed in 2005. The IBP identified and prioritized pest threats for the 15 grain crops covered within the document, allowing development of a list of high priority pests considered to be of most concern for production and/or market access.

In a review of current surveillance activities, Akbari *et al.* (2008) noted that a considerable amount of passive surveillance is undertaken by growers, consultants, agri-business, research and crop evaluation staff and bulk handlers through day-to-day activities in crop management and storage. Very little of this surveillance however is conducted in a coordinated manner which allows collection for the purposes of early detection or market access. In addition, limited targeted surveillance is occurring and none is being conducted on a nationally consistent basis.

The National Grains Surveillance Plan has been developed to address these issues and assist with biosecurity preparedness by providing practical activities for a more coordinated approach to surveillance for exotic plant pests for both early detection and to meet market access requirements. The following key recommendations from this report are presented below.

Recommendation 1:	Specific surveillance plans must be developed for pests that have a high economic impact with regard to market access and/or where early detection would have a significant chance of eradication or containment.
Recommendation 2:	Economic analyses are required for pests (or groups of similar pests) to determine whether targeted or passive surveillance (or a combination of both) is most appropriate i.e. whether surveillance will deliver a positive benefit:cost.
Recommendation 3:	A nationally coordinated system for the provision of training in biosecurity awareness, key pest threats, reporting procedures, collection of data for surveillance and Owner Reimbursement Costs for growers should be maintained and expanded.
Recommendation 4:	Mechanisms for capture of data from targeted and passive surveillance should be identified through Grains Biosecurity Officers and state agencies.
Recommendation 5:	A national first detector system is required to provide initial diagnosis of pests and abiotic stress symptoms on plants in order to have the highest likelihood of identifying a new pest incursion.
Recommendation 6:	Passive surveillance for growers should take the form of improved awareness on biosecurity and key pest threats.

Recommendation 7:	Development and promotion of Quality Assurance, HACCP or accreditation systems through the grain supply chain should be promoted to meet biosecurity tracking and surveillance needs.
Recommendation 8:	Collection of data from grain bulk handlers should be used as a source of surveillance data for pests of stored grain/market access concern.
Recommendation 9:	Collection of data from consultants and agribusiness should be used as a source of surveillance data. Collection of data from this source could occur through an annual survey funded as a research project.
Recommendation 10:	Collection of data from research and crop evaluation sites should be used as the main source of surveillance data for in-crop pests i.e. pests largely of production concern.
Recommendation 11:	Summary information from all surveillance sources should be captured in the National Plant Surveillance Reporting Tool (NPSRT). Detailed information from each surveillance program should be retained by individual agencies and businesses.
Recommendation 12:	Modifications will be required to existing databases (where information is held in electronic form) or forms (where data is held as paper copies) to allow collection of data from bulk handlers.
Recommendation 13:	Diagnostic services for potential exotic pests should be subsidised to encourage identification and reporting.
Recommendation 14:	Mechanisms for collection of passive surveillance information from diagnostic services be identified to provide evidence of absence data.

2.0 Plant health surveillance definitions and terms

This glossary contains phytosanitary terms and abbreviations included those extracted from the AQIS work instruction for phytosanitary certificate completion, EXDOC, and the International Plant Protection Convention (IPPC) adopted international standards for phytosanitary measures (ISPM), as well as acronyms used for Federal and State government, private companies and grain associated agencies.

Term/abbreviation	Definition
AQIS	Australian Quarantine and Inspection Service- operating under the Department of Agriculture, Fisheries and Forestry, AQIS is charged with the responsibility for quarantine matters and the export certification of live animals, animal products, plants and plant products.
Area	An officially defined country, part of a country or all or parts of several countries
BA	Biosecurity Australia
Commodity	A type of plant, plant product or other article being moved for trade or other purpose (Food and Agriculture Organisation, 1990)
Consignment	A quantity of plants, plant products and/or other articles being moved from one country to another and covered, when required, by a single phytosanitary certificate (a consignment may be composed of one or more commodities or lots)
CRCNPB	Cooperative Research Centre for National Plant Biosecurity
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFF	Department of Agriculture, Fisheries and Forestry
Delimiting survey	Survey conducted to establish the boundaries of an area considered to be infested by or free from a pest (ISPM 04)
Detection survey	Survey conducted in an area to determine if pests are present
Detectors	Personnel contributing to passive or targeted surveillance activities
EMS	Environmental Management System
EPP	Emergency Plant Pest
EPPRD	Emergency Plant Pest Response Deed
Exotic pests	Pests not recorded as being presented in Australia
FAO	Food and Agriculture Organisation of the United Nations
GCA	Grains Council of Australia
General surveillance	See passive surveillance

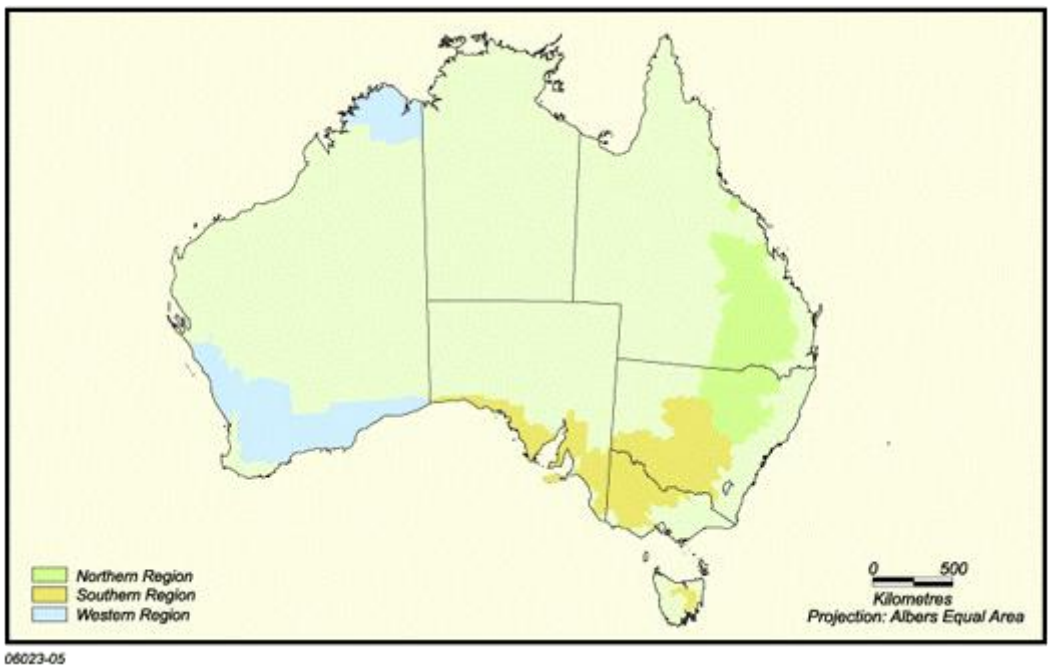
Term/abbreviation	Definition
GRDC	Grains Research and Development Corporation
HACCP	Hazard Analysis and Critical Control Points
IBP	Industry Biosecurity Plan
Inspection	Official visual examination of plants, plant products or other regulated articles to determine if pests are present and/or to determine compliance with phytosanitary regulations
IPPC	International Plant Protection Convention, a multilateral treaty for international cooperation in plant protection was deposited with FAO in 1951 and administered through the IPPC Secretariat and subsequently administered
ISPM	International Standard for Phytosanitary Measures
Monitoring survey	Ongoing survey to verify the characteristics of a pest population
NAQS	Northern Australia Quarantine Strategy
NIPI	National Invertebrate Pest Initiative
NPPO	National Plant Protection Organization/Office - Official service established by a government to discharge the functions specified by the IPPC
NPSRT	National Plant Surveillance Reporting Tool
NVT	National Variety Trial Program
OCPPO	Office of the Chief Plant Protection Officer
Passive (or general) surveillance	A range of activities outside of specific surveys that can be used to detect the presence or absence of pests (ISPM 06)
Pest	Any species, strain or biotype of plant, animal, or pathogenic agent injurious to plants or plant products. Within this document this definition includes invertebrate pests, pathogens and diseases
PFA	Pest Free Area, an area in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being officially maintained for a defined period
PHA	Plant Health Australia
Phytosanitary certificate	Certificate patterned after the model certificates of the IPPC Phytosanitary certification. Use of phytosanitary procedures leading to the issue of a phytosanitary certificate
Phytosanitary regulation	Official rule to prevent the introduction and/or spread of quarantine pests, by regulating the production, movement or existence of commodities or other articles, or the normal activity of persons, and by establishing schemes for phytosanitary certification

Term/abbreviation	Definition
Plants	Living plants and parts thereof, including seeds and germplasm
PEPQ	Post Entry Plant Quarantine
QA	Quality Assurance
Quarantine pest	A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled
SPS	Sanitary and Phytosanitary measures
Surveillance	An official process, which collects and records data on pest occurrence or absence through survey. Monitoring or other procedures (ISPM 09)
Survey	Methodical procedure conducted over a defined period of time to determine the characteristics of a pest population or to determine which species occur in an area
Targeted (or active) surveillance	Surveys to detect, or confirm absence of, specific pests. Targeted surveys should be designed with statistical rigour and be approved by the National Plant Protection Office (NPPO) or an authorised representative (ISPM 06)
Test	Official examination, other than visual, to determine if pests are present or to identify pests
Treatment	Officially authorized procedure for the killing, removal or rendering infertile of pests
WTO	World Trade Organisation

3.0 The grains industry

The Australian grains industry is primarily situated in a narrow crescent running through the mainland states, known as the grain belt. This area stretches in a curve from central Queensland, through New South Wales, Victoria and southern South Australia. In Western Australia, the grain belt covers the south-west corner of the state with a small amount also grown in the Ord region of this state (**Figure 1**). In 2006/07, approximately 39,000,000 tonnes of grains and oilseeds was produced with a gross value of $5.3 billion. This value is lower than the five year average of $7.4 billion per annum (2002/03 – 2006/07, ABS data), largely as a result of drought.

Figure 1 Australia's grain production regions



Source: The Department of Environment, Water, Heritage and the Arts; Australian Natural Resources Atlas

The grains industry consists of 25 leviable crops that fall into 4 categories, wheat, coarse grains, grain legumes and oilseeds (Table 1). Of these, 15 crops are covered under the Emergency Plant Pest Response Deed (EPPRD) and general information on each of these crops is provided in the Grains Industry Biosecurity Plan Version 2.0 (PHA, 2009).

Table 1 The 25 leviable crops of the grains industry.

Wheat	Coarse Grains	Pulses	Oilseeds
Wheat[1]	Barley[1]	Chickpea[1]	Canola[1]
	Maize[1]	Faba beans[1]	Soybeans[1]
	Oats[1]	Field pea[1]	Sunflower[1]
	Sorghum[1]	Lentils[1]	Linseed[2]
	Triticale[1]	Lupins[1]	Safflower[2]
	Canary Seed[2]	Peanuts[1]	
	Cereal Rye[2]	Mung Beans[2]	
	Millet[2]	Cowpeas[2]	
		Navy Beans[2]	
		Pigeon Peas[2]	
		Vetch[2]	

[1] Crops covered in the Grains Industry Biosecurity Plan;

[2]Crops not covered in the Grains Industry Biosecurity Plan

4.0 The need for surveillance

Since the inception of the World Trade Organisation (WTO) and the development of the Sanitary and Phytosanitary (SPS) Agreement, plant health has become a major trade-policy issue. Any country that cannot provide an adequate description of the health (pest) status of its agricultural industries through phytosanitary certificates accompanying exports is at a disadvantage when negotiating access to foreign markets (McMaugh, 2005). The basis on which Australia claims its area freedom from particular pests and diseases is extremely important both for ensuring market access and for managing concerns that trading partners may have regarding unfair trade barriers. While SPS Agreement provisions have enabled Australia to facilitate negotiations and gain new market access as well as improve market access conditions, there is a perception amongst members of the WTO that Australia has a disproportionate number of complaints raised against it, and that the time taken to resolve these issues takes far too long. Potentially more importantly, there is the perception that quarantine decisions in Australia are being used to protect domestic markets and are not based on science (Stanton, 2008). To ensure that these perceptions are corrected, scientific evidence to support area freedom claims should be transparent and result in confidence levels that a 1% prevalence of a pest or disease can be detected.

Due to Australia's relatively small population and domestic demand, export markets are essential for the viability of Australian grain farms. Australia currently exports around 60% of its grain, with wheat and barley accounting for 62% and 19% respectively, of total grain exports. Exported grain can be rejected if live insects, weed seeds or discoloured grain are detected, or if insufficient test results/laboratory documentation are presented. With Australia's reliance on exports, conducting surveillance for exotic plant pests is of utmost importance for retaining access to overseas markets.

Surveillance is therefore required for the pest threats of greatest market access concern, namely *Trogoderma* spp., Karnal bunt (*Tilletia indica*), Alternaria leaf blight (*Alternaria tritici*), weed seeds and phosphine resistant insects of stored grain. For these pests, sampling is usually best achieved in stored grain and, while significant sampling and testing is already undertaken by both government and grain companies, national coordination is needed.

In addition to market access, surveillance for early detection of exotic pests can improve the chance of eradication or containment, especially when the pest population is small and not well established. If eradication or containment is not feasible, early detection in conjunction with contingency planning and preparedness (e.g. emergency chemical registrations, pre-breeding and pre-emptive management) will assist with more rapid and effective response to the establishment of a pest.

Case Study 1 – The need for surveillance for Karnal bunt

An example of the requirement for evidence of absence data for a key pest threat to the grains industry occurred in 2004 when Pakistan claimed that wheat from Australia was infected with karnal bunt. In initial response to the claim, an 80,000 tonne shipment was rejected and movement of $400 million of wheat being shipped to other countries at the time was also stopped. It took 3-4 weeks to fully test and clear all wheat being shipped from Australia (the fungus found was identified as a strain of bunt found on ryegrass). Pakistan later claimed $2 billion in demurrage costs for the shipments held prior to being cleared.

While surveillance is clearly important for the purposes of market access and/or early detection, it is often costly and labour intensive. Benefit cost analyses are therefore recommended to determine if the benefit for conducting surveillance is justified, and to define which components of the through-chain should bear these costs. This information is also critical to raise awareness of the necessity of surveillance for both market access and early detection as it highlights the costs and impacts of potential incursions.

4.1 Requirements for surveillance data collection for Phytosanitary Certificates

The International Plant Protection Convention (IPPC, New Revised Text, 1997) and the WTO-SPS Agreement provide the legal framework under which the International Standard for Phytosanitary Measures (ISPM) are developed. ISPM 06 is most relevant to surveillance recommendations of the IPPC, termed "Guidelines for Surveillance". ISPMs 07 and 12 are also relevant, and include requirements such as "inspection and related activities leading to issuance of phytosanitary certificates shall be carried out only by, or under the authority of, the National Plant Protection Organisation (NPPO), by officers who are technically qualified and duly authorised by the NPPO with such knowledge and information available to those officers that the importing parties may accept phytosanitary certificates with confidence as dependable documents."

The ISPM most relevant to supporting claims for area freedom from plant pests is ISPM 04 "Requirements for the establishment of pest free areas", which states that countries may require evidence of area freedom from certain pests, which can include laboratory testing, official surveys and field inspections during the growth season. The strength of checking systems used to verify area freedom may vary depending on the phytosanitary security required. ISPM 04 states that these checks may include *ad hoc* inspection of exported consignments and monitoring surveys. However, irregular and informal inspections will provide less verification of area freedom claims than the regular collection of evidence to support area freedom, particularly with regard to ensuring valid scientific and statistically significant evidence. Documentation must also be provided by the exporting country to the importing country if requested, to support area freedom claims, on the:

- Data assembled to establish the pest free area (PFA)
- Various administrative measures taken in support of the PFA
- Delimitation of the PFA
- Phytosanitary regulations applied
- Technical details of surveillance, survey and monitoring systems used

The IPPC suggests that the NPPO of the exporting country should send documentation about a pest free area to a central information service (such as the Food and Agriculture Organisation (FAO) or a regional plant protection organisation) with all relevant details, so that the information can be communicated to all interested NPPOs at their request. In light of the documentation required to support pest free area claims, it is important that Australia assembles these data in a uniform manner across all states and regions, and that the technical details of surveys

and monitoring are coordinated or assembled in a manner that enables their immediate access to support challenges to our area freedom status for certain pests.

4.2 Current status of surveillance activities in the Australian grains industry

Currently, in order to meet phytosanitary requirements for export and make declarations of area freedom, requirements stipulated by the Australian government and its trading partners are followed and usually take the form of:

- Testing of seed lots for pests specified within the phytosanitary certificate or additional declaration
- Declaration of area freedom or "known not to occur" status of the pest

Information gathered from representatives from the Australian Government, state governments and grains industry stakeholders indicate that grains exporters undertake the minimum requirements to obtain a phytosanitary certificate. At present, if the grains exporter is unable to meet the phytosanitary requirements for export of a consignment to a particular country, an alternative trading partner with less stringent requirements is sought.

Akbari *et al.* (2008) presented information on surveillance activities undertaken in the Australian grains industry by the Australian Government, grain companies and state agencies. General conclusions from this report were:

- Levels of pest identification and seed assessment can vary between states as a result of differences between expertise and facilities in each region.
- Surveillance is usually undertaken by state agencies and while routine targeted surveys are rarely conducted due to lack of resources, a considerable amount of passive surveillance is undertaken by research programs, state agencies and grain handling companies.
- Few national standards and strategies are used and data collection between state agencies is inconsistent.
- Scientific evidence is often based on historical data sets or on absence of pest records from passive surveillance.
- The lack of coordinated surveillance data for pests can impact on the level of information available to undertake risk assessments and respond to requests from trading partners.
- Training processes are needed to ensure suitably qualified personnel are available to provide surveillance data.
- Targeted surveys require development of protocols with statistically valid procedures which provide high confidence levels.
- Protocols must be endorsed and implemented by all states.

- BA and AQIS must be consulted regarding appropriate protocols, to provide an understanding of the phytosanitary requirements of pests to assess the minimum procedures/supporting evidence needed.
- Specific surveillance procedures are needed for early detection surveys.

Several programs (outlined in Case Studies 2, 3, 4, 5 and 6) conduct on-going surveillance in jurisdictions across Australia to allow early detection of exotic plant pests or provide information for market access.

Case study 2 – Current surveillance activities

The Grains On-farm Biosecurity Program

The Grains On-farm Biosecurity Program is a national initiative of the Grains Council of Australia delivered through Plant Health Australia. This program is appointing dedicated Biosecurity Officers in Western Australia, Victoria, South Australia and Queensland through funding provided from grain grower levies, the CRC for National Plant Biosecurity and state Departments of Primary Industries.

The Biosecurity Officers provide industry biosecurity capacity and capability and are responsible for biosecurity training and awareness for government and industry personnel including researchers, growers, agribusiness and grain bulk handlers. They will also investigate and coordinate collection and collation of surveillance data as outlined under the National Surveillance Plan.

Case Study 3 – Current surveillance activities

CropSafe

The CropSafe program was established in 2007 through the Victorian Government's "Enhancing Victoria's Plant Biosecurity" to improve capacity for surveillance. This program will create enhanced passive surveillance systems through a range of DPI staff and agribusiness personnel engaged to form a network of experienced "detectors" to identify new or unknown pests and diseases in grain crops.

This network will provide a more formal structure for passive surveillance by ensuring that front line professionals, who identify common pests and diseases, pass unknown or suspicious samples to another level of more experienced diagnosticians for full identification.

In addition to this passive surveillance network, targeted surveillance will also be undertaken for specific pests. In 2008/09, CropSafe will be linking with the National Grains On-farm Biosecurity Program (Case Study 2), to improve biosecurity capability and capacity and ensure data collected within CropSafe are collated in the National Plant Surveillance Reporting Tool (NPSRT).

Case Study 4 - Current surveillance activities

National Invertebrate Pest Initiative

The National Invertebrate Pest Initiative (NIPI) brings together scientists from state government departments, universities, farmer groups and CSIRO to address pest management issues in the Australian grains industry. It is supported by growers and the Australian Federal Government through the Grains Research and Development Corporation (GRDC).

NIPI has established and runs a free email information service that alerts growers and consultants to invertebrate pest issues and solutions through Pest Fax/PestFacts services in New South Wales, Victoria, South Australia and Western Australia. NIPI also funds pest identification workshops in these regions.

While no direct collection of surveillance data is currently undertaken within the NIPI program, identification and understanding of common pests within grain crops is an important step in recognising new pests and the NIPI program could provide a vehicle for delivery of information on biosecurity pest threats.

Case Study 5 - Current surveillance activities

The Australian Cereal Rust Control Program

The Australian Cereal Rust Control Program (ACRCP) was established in 1973 and is hosted at the Cereal Rust Laboratory at the Plant Breeding Institute, University of Sydney. This program, funded by GRDC, aims to reduce the frequency and severity of cereal rust outbreaks in grains by monitoring cereal rust pathogens throughout Australia, assessing new sources of rust resistance and assisting cereal breeding groups incorporate rust resistance genes in new cultivars. It has been highly successful and has been estimated in a recent economic study to have delivered benefits of $2144 million in total.

Pathogenicity surveys of the following rust pathogens are conducted annually and are an important source of surveillance data for early detection of new rust species, strains and biotypes:

Wheat stem rust	*Puccinia graminis tritici*
Wheat leaf rust	*Puccinia triticina*
Wheat stripe rust	*Puccinia striiformis tritici*
Barley leaf rust	*Puccinia hordei*
Oat stem rust	*Puccinia graminis avenae*
Oat leaf (crown) rust	*Puccinia coronata*
Rye stem rust	*Puccinia graminis secalis*

Case Study 6 - Current surveillance activities

Northern Australian Quarantine Strategy (NAQS)

Quarantine in northern Australia is critical owing to the area's proximity to South-East Asia and the Pacific, which harbours many pests not found in Australia. The Northern Australia Quarantine Strategy (NAQS) focuses on developing and implementing measures for the early detection of targeted pests in the coastal region from Cairns to Broome, including the Torres Strait.

NAQS activities include scientific surveys and monitoring, border activities, on- and offshore capacity building and public awareness activities in northern Australia, Papua New Guinea, Indonesia and East Timor. NAQS also provides quarantine management of the movement of people and goods from the outer Torres Strait Islands (Torres Strait Protected Zone) to the inner Torres Strait Islands (Special Quarantine Zone). With regard to the grains industry, NAQS conducts surveys in sorghum and maize for the following pests:

- Grey leaf spot (maize)
- Stewart's wilt of maize
- Leaf scald (maize)
- Rose beetle (maize and sorghum)
- Spotted stalk borer and Spotted borer (maize)
- Cabbage looper (maize and sorghum)
- Philippine downy mildew (maize)
- Downy mildew of sorghum
- Sorghum mosaic virus
- Maize dwarf mosaic virus
- Indian cotton leaf hopper (maize and sorghum)
- May beetle (maize and sorghum)

5.0 Components of the National Grains Surveillance Plan

In order to meet the requirements for Phytosanitary certificates and have a consistent approach to surveillance data collection, a national surveillance plan is required by the grains industry. During consultation for development of such a plan, discussions with grains stakeholders highlighted that few targeted surveillance programs are run on a national basis (Akbari *et al*. 2008). In addition, while passive surveillance by growers, consultants, agribusiness, grains bulk handling staff and research staff is undertaken through day-to-day activities, very little of this information is recorded.

In the following sections, requirements and recommendations for the National Grains Surveillance Plan are outlined. This Plan has been developed to cover pests (including invertebrates and pathogens) and, although weeds are not explicitly covered, many of the general principles associated with surveillance could be expanded to include them.

5.1 Surveillance for key pests

Through Plant Health Australia, the Grains Industry will release the Grains Industry Biosecurity Plan (IBP) Version 2.0 in 2009. Within this IBP, priority pests were identified that were considered to be of high or medium overall risk to the grains industry for market access and/or production (Table 2). This is not a complete list of all pest threats and is not intended as a definitive list of all threats or an actionable pest list for the purposes of quarantine; however it provides a basis for identifying exotic pests for which surveillance is required.

In addition to the pests listed in Table 2, surveillance may also be necessary for established pests that pose a threat to production or market access. It is also essential to acknowledge that an ongoing understanding and recognition of established pests by industry personnel will offer the best chance of detecting new pest incursions.

Table 2 Priority pest list for the grains industry (taken from the Grains Industry Biosecurity Plan Version 2.0).

Common name	Scientific Name	Commodity	Overall risk rating	Surveillance required	Primary reason for surveillance
Karnal bunt	*Tilletia indica*	Wheat	Extreme	Grain	Market access and early detection
Leaf blight	*Alternaria triticina*	Wheat, oat, barley, triticale, durum	High	In-crop	Market access and early detection
Khapra beetle	*Trogoderma granarium*	All stored grains	High	Grain	Market access and early detection
Spotted stalk borer	*Chilo partellus*	Sorghum	High	In-crop	Early detection
Lentil anthracnose	*Colletotrichum truncatum* – lentil strain	Lentil	High	In-crop	Early detection
Sunflower stem canker	*Diaporthe helianthi* ana. *Phomopsis helianthi*	Sunflower	High	In-crop	Early detection
Russian wheat aphid	*Diuraphis noxia*	Wheat, barley, triticale, oats	High	In-crop	Early detection
Leaf spot	*Drechslera tetramera*	Lentil, field pea, sorghum, canola, maize	High	In-crop	Early detection
Hessian Fly	*Mayetiola destructor*	Wheat, triticale	High	In-crop	Early detection
Barley stem gall midge	*Mayetiola hordei*	Barley	High	In-crop	Early detection
Philippine downy mildew of maize and downy mildew of sorghum	*Peronosclerospora philippinensis, P. sorgi*	Maize, sorghum	High	In-crop	Early detection
Sunflower downy mildew	*Plasmopara halstedii*	Sunflower	High	In-crop	Early detection
Maize dwarf mosaic virus	*Potyvirus maize dwarf mosaic virus*	Maize, sorghum	High	In-crop	Early detection
Peanut stripe virus	*Potyvirus peanut stripe virus*	Peanut	High	In-crop	Early detection

Common name	Scientific Name	Commodity	Overall risk rating	Surveillance required	Primary reason for surveillance
Exotic barley rusts including Barley Stripe Rust and Barley Crown Rust and strains of Barley stem rust	*Puccinia striiformis* f.sp. *hordei*, *P. coronata* f. sp. *horde*, *P. graminis* f. sp. *hordei*	Barley	High	In-crop	Early detection
Exotic wheat rusts including strains of stem, leaf, stripe rust and durum leaf rust	*Puccinia graminis* f. sp. *tritici*, *P. triticina*, *P. striiformis* f. sp. *tritici*, *P. recondita*	Wheat and durum	High	In-crop	Early detection
Net form of net blotch	*Pyrenophora teres* f.sp. *teres* (resistant strains) NZ & UK	Barley	High	In-crop	Early detection
Red clover mosaic virus	*Red clover mosaic carlavirus*	Faba bean, field pea	High	In-crop + seed	Early detection
Fusarium wilt of canola, chickpea, lentil and lupin	*Fusarium oxysporum* (f.sp. *conglutinans, ciceris, lentis, lupini)*	Canola	High-Medium	In-crop	Early detection
Leafminers specific to Poaceae	*Agromyza ambigua, A. megalopsis, Chromatomyia fuscula, C. nigra*	Wheat, barley, triticale	Medium	In-crop	Early detection
Turnip moth	*Agrotis segetum*	Wheat, canola, chickpea, triticale,	Medium	In-crop	Early detection
Sorghum shoot fly	*Atherigona soccata*	Sorghum	Medium	In-crop	Early detection
European wheat stem sawfly	*Cephus pygmeus*	Wheat, barley, oat, triticale	Medium	In-crop	Early detection
Cabbage seedpod weevil	*Ceutorhynchus assimilis*	Canola	Medium	In-crop	Early detection
Soybean cyst nematode	*Heterodera glycines*	Soybean	Medium	In-crop	Early detection
Cereal cyst nematodes	*Heterodera latipons, H. filipjevi, H. avenae* (exotic strains)	Wheat, barley, oat	Medium	In-crop	Early detection
Sunflower moth	*Homoeosoma electellum*	Sunflower	Medium	In-crop	Early detection

Common name	Scientific Name	Commodity	Overall risk rating	Surveillance required	Primary reason for surveillance
Leafminer species	*Liriomyza trifoli, Chromatomyia horticola*	Lupin, chickpea, faba bean, peanut, soybean	Medium	In-crop	Early detection
Wheat stem maggot	*Meromyza saltatrix*	Wheat	Medium	In-crop	Early detection
Wheat aphid	*Sitobion avenae*	Wheat	Medium	In-crop	Early detection
Lentil rust	*Uromyces viciae-fabae*-(lentil strain)	Lentil	Medium	In-crop	Early detection
Canola verticillium wilt	*Verticillium longisporum*	Canola	Medium	In-crop	Early detection
Black chaff	*Xanthomonas campestris, X. translucens*	Wheat, barley	Medium	In-crop	Early detection

5.2 Types of surveillance

Different types of surveillance may be more cost beneficial or effective for each plant pest (or groups of pests with similar biology) depending on host, pest biology and epidemiology, potential impact to the industry, complexity of pest or disease diagnosis and the reasons for conducting surveillance.

5.2.1 Passive surveillance

Passive (or general) surveillance is the collection of information from "informal" sources including first detectors (see Section 5.3.2) and diagnostic laboratories as well as research and breeding trial sites that are not specifically set up for detection of exotic pest threats. When considering passive surveillance data from a variety of sources for the purposes of defending claims of area freedom, it is essential to have mechanisms for data capture and validation and a means for verifying a new detection.

Passive surveillance is likely to occur through routine activities associated with crop management or grain storage and is best undertaken for (although is not limited to) pests where early detection will provide the best chance of eradication, containment or more rapid implementation of appropriate management strategies.

Data from passive surveillance will provide an important source of large volumes of data from different grain growing regions and, if collected on a national basis, could be used to support targeted surveillance to ensure that sufficient negative data is collected to validate phytosanitary certificates. The value of passive surveillance has been shown by Pheloung (2004), who observed that in a fifteen year reporting period, approximately two thirds of plant pest detections in Australia, were made by growers, agri-industry and the general public.

Issues with the use of passive surveillance data include confidentiality requirements of private companies providing data, and, if data are used to support market access, identifying mechanisms to convey the information to a central database such as the National Plant Surveillance Reporting Tool (NPSRT) (see Section 5.4). In addition, while growers, consultants and agribusiness are in constant contact with crops and are likely to recognise "something unusual", they may have little formal training in plant pathology or entomology. While passive surveillance will therefore occur every season through routine crop management, it is possible to increase the efficiency and efficacy of passive surveillance by providing training on the basic identification of key pest threats and collection and delivery of samples to diagnostic laboratories to confirm new pest detections. To assist detectors manage large numbers of potential target pests, it may be beneficial to conduct training on a rotational basis (e.g. every 2-4 years) to ensure that surveillance activities are undertaken for a wide range of pests.

To make best use of passive surveillance data, statistical modelling is also required to determine how confidence levels of detection at a regional or national level can be increased by multiplying the number of observations by the number of years of data collection.

5.2.2 Targeted Surveillance

Targeted surveillance is the collection of surveillance data from trials and/or sampling protocols specifically set up to identify a high priority pest to a proposed confidence level. Targeted surveillance may be needed to provide rigorous scientific evidence in the event of a claim by a trading partner of potential detection of a pest, as part of delimiting surveys following a pest detection, as evidence for area freedom or where general surveillance is unlikely to identify the particular pest in question due to cryptic or generic symptoms. Targeted surveillance will therefore require appropriately authorised staff trained in survey design, sampling and diagnostics. Targeted surveillance is best undertaken for exotic pests where establishment would have a high economic impact with regard to market access and/or where early detection would have a significant chance of eradication or containment.

To make best use of resources, economic analyses should be conducted for each targeted pest to assess whether the economic benefits outweigh the inputs required in undertaking targeted surveillance.

5.2.3 Guidelines for different surveillance activities

The following guidelines have been provided to indicate whether targeted or passive surveillance systems (or a combination of both) should be implemented.

Targeted surveillance is recommended where:

- Market access: Export crops are reliant on high quality data to support area freedom from the pest
- Value: The pest would have a high economic and/or social impact if established
- Eradication: There would be a high chance of eradication of the pest if detected early
- Cryptic: The pest is hard to distinguish from existing pests or diagnose without specific sampling and assessment
- Extent/limit required: A potential new detection has been made or is suspected

Passive surveillance is recommended where:

- Market access: Export crops are reliant on high quality data to support area freedom from the pest. Passive surveillance would generally be recommended in conjunction with targeted surveillance
- Value: The pest would have a high economic and/or social impact if established
- Eradication: There would be a high chance of eradication of the pest if detected early or there would be improved chance of implementing management strategies once detected
- Easily identified: The pest is relatively easy to identify or diagnose without specific sampling and assessment

Recommendation 1:	Specific surveillance plans must be developed for pests that have a high economic impact with regard to market access and/or where early detection would have a significant chance of eradication or containment.
Recommendation 2:	Economic analyses are required for pests (or groups of similar pests) to determine whether targeted or passive surveillance (or a combination of both) is appropriate (i.e. a positive benefit:cost analysis).

5.3 Roles and responsibilities for surveillance

The identification of personnel and systems to conduct surveillance and capture data is essential to ensure that information on high priority pests is collected in a consistent manner that enables meet market access requirements to be met and/or provide confidence of early detection.

5.3.1 Nationally coordinated farm biosecurity and surveillance program

The maintenance of a national program for the provision of biosecurity preparedness and prevention for the grains industry is needed to coordinate surveillance. In particular, passive surveillance from day-to-day crop management and storage requires mechanisms to collect data from disparate sources. The Grains On-farm Biosecurity Program (Case study 2), has been initiated to assist provide this role through appointment of Grains Biosecurity Officers in Western Australia, South Australia, Victoria and Queensland. As this program is implemented, it will progress the training and extension for general biosecurity awareness and basic recognition of key pest threats. In addition, Grains Biosecurity Officers will assess and develop mechanisms for collection of data from different sources including crop evaluation and research trials, diagnostic services and potentially from consultants and growers.

Recommendation 3:	A nationally coordinated system for the provision of training in biosecurity awareness, key pest threats, reporting procedures, collection of data for surveillance and Owner Reimbursement Costs for growers should be maintained and expanded.
Recommendation 4:	Mechanisms for capture of data from targeted and passive surveillance should be identified through Grains Biosecurity Officers and state agencies.

5.3.2 First detectors

Within this document, personnel conducting passive or targeted surveillance are referred to as “detectors”. “First detectors is a term used by the CropSafe Program run by DPI Victoria (Case study 3), and the National Plant Diagnostic Network in the United States and refers specifically to individuals who are in continual contact with crops and/or with significant experience with a crop type or region and this terminology will also be used within this document. First detectors are well placed to recognise ‘anything unusual’ such as new pest incursions or

development of new pest strains, and represent an important component of the surveillance network. By utilising and supporting this network of skilled people the strength of surveillance strategies is increased.

Types of detectors in the grains industry are discussed in the following sections and include:

- Growers
- Extension or research staff
- Crop consultants/agronomists
- Commercial/supplier representatives
- Grain companies (bulk handlers)

In order to be effective as a first detector for surveillance, individuals must be aware of common pests and abiotic stress symptoms, where to send samples to check identification if a new pest is suspected, and how to report a suspected new pest or unusual sample. They must also be aware of the importance of biosecurity and the potential impact of new pests. First detectors with experience in established pests and abiotic/physiological plant stresses are able to train and mentor less experienced personnel.

Recommendation 5:	A national first detector system is required to provide initial diagnosis of pests and abiotic stress symptoms on plants in order to have the highest likelihood of identifying a new pest incursion.

5.3.3 Growers

While growers may be the first individuals to recognise a new pest or unusual symptoms in crops, sufficient incentives need to be made available to encourage growers to report a new pest occurrence. A communication strategy is therefore required to promote awareness and importance of biosecurity as well as mechanisms for reimbursement if an eradication response is undertaken under the EPPRD.

A second issue with collection of surveillance data from growers is the lack of incentives or benefits for growers to provide these data. There is currently little uptake of systems that could be used as vehicles to collect data, such as Quality Assurance or accreditation schemes, the Environmental Management System (EMS), Hazard Critical Control Point (HACCP) programs or Food Safety declarations and, without these mechanisms, collection of surveillance data from growers is likely to be extremely difficult.

Recommendation 6:	Passive surveillance for growers should take the form of improved awareness on biosecurity and key pest threats.
Recommendation 7:	Development and promotion of Quality Assurance, HACCP or accreditation systems through the grain supply chain should be promoted to meet biosecurity tracking and surveillance needs.

5.3.4 Grains bulk handlers

As grain bulk handler (grain companies) staff assess grain consignments for live insects and purity through the course of grain transport and storage, collection of data for pests of stored grain could occur as part of existing sampling processes. Individuals within grain bulk handling companies will act as First Detectors. Training will be required to ensure staff have sufficient knowledge to recognise pests of market access concern that need to be forwarded to laboratories for full diagnosis. Staff will also need to be aware of appropriate reporting mechanisms. While grains companies have existing databases and/or forms for recording sampling and consignment information, to assist with data collection into NPSRT, modifications to databases would be required to allow records of absence of pests to be made.

Recommendation 8:	Collection of data from grains bulk handlers should be used as a source of surveillance data for pests of stored grain/market access concern.

5.3.5 Consultants and agribusiness

Collection of data from consultants and agribusiness could occur using existing systems such as the National Cereal Rust Control Program, Pest Facts, NIPI, CropSafe and the Grains On-farm Biosecurity Program to promote and gather data for collection of absence of pests, however a mechanism is required to capture and summarise these data into NPSRT.

Collection of data from consultants and agribusiness could occur through Grains Biosecurity Officers and/or an annual survey, funded as a research project following a similar model to that used in the cotton industry to collect data. This survey could include questions on the types of key pest threats and numbers of paddocks assessed throughout a growing season. A similar mechanism also operates in the Citrus industry through a project to collect and capture data from research trials.

For implementation of these systems of data collection and capture, training in the importance of biosecurity and reporting requirements for identification of new pests will be required.

Recommendation 9:	Collection of data from consultants and agribusiness should be used as a source of surveillance data. Collection of data from this source could occur through an annual survey funded as a research project.

5.3.6 Research, crop evaluation or breeding trials

A high priority for surveillance are field trials within breeding and research programs as these sites are established over a wide geographic area and are run by trained personnel with good knowledge of common pests, diseases and abiotic issues. When coupled with basic training in the recognition of key pest threats and information on reporting new pests, these staff would be capable of collecting large volumes of passive surveillance data.

Crop evaluation, breeding and research programs represent high risk areas as while Post Entry Plant Quarantine (PEPQ) procedures process the bulk of new germplasm entering Australia, field sites run by these programs often represent the first point of field introduction of new material, potentially identifying pests that may have been missed in visual inspection in PEPQ. In addition, these sites have continual movement of germplasm and equipment throughout regions representing a significant pathway of distribution for new pests. Crop evaluation, breeding and research programs therefore represent an important potential source of information for both passive and targeted surveillance.

With relatively small input of funds for data collection from these sites, it is therefore proposed that these sites be the main source of information collected from passive surveillance for "in-crop" pests (i.e. pests would be observed during crop production). In most cases, priority in-crop pest threats would be largely a production rather than a market access concern. Early detection of these pests will be critical if eradication or containment is to be attempted, or for more rapid delivery of management packages to limit the impact of the pest.

Recommendation 10:	Collection of data from research and crop evaluation sites should be used as the main source of surveillance data for in-crop pests i.e. pests largely of production concern.

5.4 Data collection and record keeping

5.4.1 Data collection

To support claims of area freedom, ISPM 06 'Guidelines for surveillance' states that the "NPPO should keep appropriate records derived from general surveillance and specific surveys" i.e. to use data from surveillance for domestic or international market access, it must be collected, verified and compiled into a system that allows access to records by the NPPO.

To assist with this objective, the National Plant Surveillance Reporting Tool (NPSRT) has been developed and is administered through the Office of the Chief Plant Protection Officer and Plant Health Australia. NPSRT provides a focal point for collation of descriptions of national surveillance activities allowing a rapid means for providing information for market access or pest incursions. NPSRT provides summary information only, and detailed information must still be held by individuals, agencies and businesses conducting each surveillance program. At present, while a large amount of surveillance is undertaken nationally through passive assessment of trials and crops, and a smaller amount occurs through targeted surveillance activities, data on the absence of pests are rarely recorded. There is therefore an ongoing need to consolidate summary data held by various sources into NPSRT to provide support for claims of area freedom.

5.4.2 Record keeping for targeted surveillance programs

When data are collected as part of targeted surveillance programs, the following minimum information should be recorded:

- Scientific name of the pest
- Common name of the host
- Types of sampling method used e.g. trap, soil sample, sweep net
- Location (e.g. address including specific details such as paddock or glasshouse identifier, GPS or map coordinates)
- Collection details (i.e. date of collection and name of collector)
- Additional information (e.g. level of infestation, growth stage of plant, symptoms of pest damage)

Where samples are collected and identified as part of a targeted or delimitation survey, details of the identification (e.g. date and name of personnel undertaking initial identification) and verification (e.g. date and name of personnel from verification laboratories) should also be recorded.

5.4.3 Record keeping for passive surveillance programs

Within ISPM 06 "Guidelines for surveillance" the use of passive (general) surveillance is permitted providing components of the system include a record keeping and retrieval database for information and data verification procedures. Records still need to include the minimum information listed in Section 5.4.2 and therefore even for passive surveillance; detectors will need to have training in the types of pests included as targets and/or the surveillance program will need to define pests likely to be identified by detectors.

Recommendation 11:	Summary information from all surveillance sources should be captured in the National Plant Surveillance Reporting Tool (NPSRT). Detailed information from each surveillance program should be retained by individual agencies and businesses.

Priority areas for surveillance

Areas may be a priority for surveillance due to their high risk potential within a potential incursion pathway and/or the ability to 'value add' to existing activities already occurring at these sites.

5.4.4 Ports of entry

While only comparatively small quantities of grain are usually imported into Australia, ports of entry may act as a potential risk point for new pest incursions due to the small size of many pests, the sheer volume of trade through ports in Australia and the often close geographic proximity to silos used for storage of grain for export.

To minimise the risks associated with grain pests entering Australia in or on shipping containers, external inspection of all containers is undertaken. In addition, prior to use to transport grain each container must satisfy a set of cleaning and tracing requirements.

While little or no surveillance for grain pests is currently undertaken at ports of entry, training of staff from grains companies in basic identification of exotic pests of stored grain and surveillance for pests such as Khapra beetle that respond to lure traps should be undertaken at ports, particularly in areas where export grain is stored (see Section 5.3.4 and 5.5.3).

5.4.5 Research and crop evaluation sites

As mentioned in Section 5.3.6, high priorities for surveillance are field trials within breeding and research programs as, following Post Entry Plant Quarantine for germplasm, these sites often represent the first point of entry of field introduction of new material. Coupled with the high training levels of personnel managing these trials, these sites represent a valuable source of surveillance information.

5.4.6 Grains Bulk Handling receival and storage points

As mentioned in Section 5.3.4 and 5.5.1, training of grains bulk handling personnel in detection of key pests of market access concern will provide a system of first detectors in areas constantly managing stored grain. In addition, receival and storage points for grain offer significant opportunities for surveillance either through capturing data already being collected through the existing sampling and assessment process or by integrating visual inspections for pests of market access concern into these systems.

Some storage silos collect information for pests such as Khapra beetle that respond to lure traps and this information should be collected for input in NPSRT. This type of surveillance should be expanded to all companies/sites handling large quantities of stored grain.

5.4.7 Other high risk sites

High risk sites also exist outside the grains industry's control and include:

- Urban residences
- Retail and farmer's markets
- Volunteer hosts or weeds on roadsides, council or federal land or private residences
- Processing plants
- High intensity animal production areas such as feed lots, poultry farms or piggeries

While many of these are areas where pests may become established, difficulties with undertaking surveys and capture of data limit cost-efficient collection of data from these sites.

Recommendation 12:	Modifications will be made to existing databases (where information is held in electronic form) or forms (where data is held as paper copies) to allow collection of surveillance data from grains bulk handlers.

5.5 Diagnostic services

The success of surveillance programs will depend on the ability to correctly identify suspected exotic pathogens and therefore diagnostics is a critical component of collecting and verifying surveillance data.

The trend towards cost recovery in many areas of plant pest diagnostics has seen a reduction in the number of samples received by laboratories and corresponding reduction in the amount of data available for the purposes of surveillance. Where diagnostics have been subsidised, for example through the WA Diagnostic Laboratories or the National Invertebrate Pest Initiative, there has been continued use of diagnostic services.

In addition to acting as a passive surveillance system, the provision of a free or low cost diagnostic service provides a source of training for new personnel within the grains industry, as individuals learn to recognise and compare symptoms of endemic pests from samples submitted. This is particularly important in agribusiness, where staff turnover is high, and new staff may be based in regional areas with limited access to training facilities.

An issue perceived with the increased implementation of surveillance activities, is the workload increased numbers of samples may place on diagnostic facilities. This issue may be resolved, at least in part, by the use of first detectors to conduct preliminary diagnosis of samples for endemic pests or abiotic issues (section 5.3.2). By providing a filtering system to limit the number of samples received by diagnostics laboratories as well as a mechanism for training, as new staff are mentored by experienced field staff, first detectors may mitigate the increased workload involved with passive surveillance.

Recommendation 13:	Diagnostic services for potential exotic pests be subsidised to encourage identification and reporting of pests.

5.5.1 Use of diagnostic services to collect passive surveillance data

As diagnostic operations are undertaken by skilled staff, are often performed in conjunction with collaborative research activities for pests or diseases of concern, and be the first area where new pests are positively identified, diagnostic laboratories are an important source of both passive and targeted surveillance data.

Issues exist with the use of diagnostic services to collect passive surveillance data. In particular, under ISPM 06, use of passive surveillance data relies on records being kept of the pest being assessed in the surveillance system. As diagnostic laboratories currently only record the pests that are detected, mechanisms will need to be incorporated into current systems to record pests that are absent from samples.

Recommendation 14:	Mechanisms for collection of passive surveillance information from diagnostic services be identified to provide evidence of absence data.

5.6 Awareness and training

While AQIS provides an important role in minimising entry of pests into the country, they cannot provide complete protection from all risks. There is therefore a need to raise awareness in the general public and grains industry in the risks associated with overseas travel and movement of goods into Australia, resulting in a better chance of early detection of pests.

Within ISPM agreements, activities leading to issuance of phytosanitary certificates must be undertaken by personnel who are “technically qualified and duly authorised” and must be based on scientific principles and evidence. If data are collected by individuals who are not employed within state agencies, trading partners must be satisfied in the veracity of the data provided.

Training of students in plant pathology and entomology is therefore required to ensure the continuity of specialised knowledge and skills. Training of surveillance personnel including government staff, scientists, agronomists, consultants and growers is also needed to ensure that they are better able to recognise and report exotic pests and diseases. Methods proposed to ensure biosecurity information is delivered in a consistent and auditable way is the use of national programs for delivery of biosecurity information (such as Case Studies 2, 3, 4 and 6), accreditation of training programs and/or the use of competency based training. This would ensure that data is collected in a reliable manner and can be accepted with confidence.

5.7 Incentives for surveillance and reporting pest detections

When considering improving data collection and capture for exotic plant pests, the issue of incentives and disincentives to report new plant pests, particularly from passive surveillance data from non-government sources, must be addressed. Training required for personnel undertaking surveillance includes information on if and when an eradication response may be undertaken and the importance of early detection for potential eradication or containment. For growers, information is also required on how new plant pests can decrease marketability of

grain and/or increase production costs and complexity of management and the provision of Owner Reimbursement Costs if eradication is undertaken as part of a Response Plan under the EPPRD.

6.0 General pest threat plans

From the table of key pest threats listed in Section 5.1, generic requirements for the surveillance for each of the pest groups is provided in the following section. For some pests, specific surveillance plans are under development and, where available, information has been provided as comments.

Karnal Bunt	
Issue	Market access
Type of surveillance recommended	Targeted and passive
Training required	For passive surveillance, training is recommended in basic recognition of bunted grain For targeted surveillance, training will be required in sampling procedures for stored grain and diagnostics of karnal bunt
Proposed delivery of surveillance	Grain bulk handler staff; staff from research agencies and breeding programs
Data capture and collection	Mechanism to be identified through development of a specific surveillance plan
Comments	As Karnal bunt is a pest of major market access concern, the CRCNPB has research projects underway to develop specific surveillance plans. It is anticipated these plans will provide more detailed information on the type of surveillance most appropriate for detection, types of sampling required and numbers of samples required to give different confidence levels of detection

Khapra beetle (and phosphine resistant insects of stored grain)	
Issue	Market access
Type of surveillance recommended	Targeted and passive
Training required	For passive surveillance for Khapra beetle, training is recommended for basic recognition of larvae in grain. Specific information is required for surveillance for phosphine resistant insects (see comments below) For targeted surveillance training will be required in sampling procedures for stored grain and diagnostics of karnal bunt
Proposed delivery of surveillance	Grain bulk handler staff; staff from research agencies and breeding programs

Data capture and collection	Mechanism to be identified through specific surveillance plan
Comments	As Khapra beetle and phosphine resistant insects are pests of major market access concern, the CRCNPB has research projects underway to develop specific surveillance plans for stored grain pests, diagnosis of Khapra beetle and management of phosphine resistance
Leaf diseases including exotic rusts (strains of wheat stem, leaf and stripe rust; durum leaf rust; barley stripe rust; strains of barley stem and crown rust; lentil and pea rusts), Leaf blight, Leaf spot, Net form of net blotch	
Issue	Production
Type of surveillance recommended	Passive
Training required	Training for first detectors in identification of exotic leaf diseases. Where exotic strains look the same as established strains, training is required on expected reactions of varieties where these are likely to occur
Proposed delivery of surveillance	National Cereal Rust Control Program; Crop evaluation and research trials; first detectors
Data capture and collection	Mechanism to be identified through the National Cereal Rust Control Program
Comments	Ongoing submission of rust samples to the National Cereal Rust Control Program should continue to be promoted. Diagnosis of new rust species and strains will occur through this system

Stem midges and flies (including Hessian fly, Barley stem gall midge, Wheat stem maggot, Wheat stem sawfly and Sorghum shoot fly)	
Issue	Production
Type of surveillance recommended	Passive and targeted
Training required	Training in identification of symptoms of these pests for crop evaluation and staff managing research trials; first detectors
Proposed delivery of surveillance	Crop evaluation and research trials; first detectors
Data capture and collection	Mechanism to be identified through Grains Biosecurity Officers
Comments	These pests are relatively hard to find and identify and passive surveillance may not detect them until well established. Targeted surveillance is therefore required to provide confidence of early detection.

Exotic aphids (including Russian wheat aphid and Wheat aphid)	
Issue	Production
Type of surveillance recommended	Passive and targeted
Training required	Training for crop evaluation and research staff in identification of symptoms of this group of pests. Training for sampling and diagnosis of Russian wheat aphid if targeted surveillance is implemented

Proposed delivery of surveillance	Crop evaluation and research trials
Data capture and collection	Mechanism to be identified through Grains Biosecurity Officers
Comments	These pests may be difficult to distinguish from common aphid pests and passive surveillance may not detect them until well established. Targeted surveillance may therefore be required to provide confidence of early detection
Exotic in-crop pests (including Spotted stalk borer in maize; Cabbage seed pod weevil; Leafminer spp; Sunflower moth; Turnip moth)	
Issue	Production
Type of surveillance recommended	Passive and targeted
Training required	Training in identification of symptoms of these pests for crop evaluation and staff managing research trials; first detectors
Proposed delivery of surveillance	Crop evaluation and research trials; first detectors
Data capture and collection	Mechanism to be identified through Grains Biosecurity Officers
Comments	Where symptoms of insect pests are difficult to distinguish from established pests or abiotic stresses, passive surveillance may not detect them until well established. Targeted surveillance may therefore be required to provide confidence of early detection however economic analysis should be undertaken to determine if it provides a positive benefit/cost

Exotic viruses (including Red clover mosaic virus in pulses; Peanut stripe virus; Maize dwarf mosaic virus)	
Issue	Production
Type of surveillance recommended	Targeted
Training required	Training in sampling and diagnostics for these pests
Proposed delivery of surveillance	Research staff with specific expertise in sampling and diagnosis of these pests
Data capture and collection	Targeted surveys
Comments	Symptoms of viruses are often easily confused with abiotic stress factors or other disease symptoms and targeted surveillance is therefore recommended to provide reliability of early detection. Economic analyses may be required to determine whether targeted surveillance for these pests provides a positive benefit cost

Downy mildews (including Philippine downy mildew in maize, Downy mildew of sorghum and Sunflower downy mildew)	
Issue	Production
Type of surveillance recommended	Passive
Training required	Training in identification of symptoms of these pests for crop evaluation and staff managing research trials; first detectors
Proposed delivery of surveillance	Surveys through NAQS; first detectors; crop evaluation and research staff

Data capture and collection	Continued reporting by NAQS into NPSRT. Mechanisms for data collection from trials to be investigated by Grains Biosecurity Officers
Comments	Ongoing surveys by NAQS may provide sufficient passive surveillance for early detection in Northern Australia. Additional data collection in southern parts of Queensland and NSW may be required
Fungal and bacterial pathogens (including Fusarium wilts of Canola, Chickpea, Lupin and Lentil; Lentil anthracnose; Canola verticillium wilt and Black chaff of wheat; Sunflower stem canker)	
Issue	Production
Type of surveillance recommended	Passive and targeted
Training required	Training in identification of symptoms of these pests for crop evaluation and staff managing research trials; first detectors
Proposed delivery of surveillance	Crop evaluation and research trials; consultants; first detectors
Data capture and collection	Mechanism to be identified through Grains Biosecurity Officers
Comments	Where symptoms are relatively easy to distinguish, consultants and growers can be included in awareness campaigns for these pests

Cyst nematodes (including exotic strains and species of Cereal cyst nematodes and Soybean cyst nematode)	
Issue	Production
Type of surveillance recommended	Passive and targeted
Training required	Training in identification of symptoms of these pests for crop evaluation and staff managing research trials; first detectors. For exotic strains/species of cereal cyst nematode that are difficult to distinguish from the established species, training is required in detection of differences in varietal reactions.
Proposed delivery of surveillance	Training in identification of symptoms of these pests for crop evaluation and staff managing research trials; first detectors
Data capture and collection	Mechanism to be identified through Grains Biosecurity Officers
Diagnostics	Symptoms of these pests may be difficult to distinguish from established pests or abiotic stresses, and passive surveillance may not detect them until well established. Targeted surveillance may therefore be required to provide confidence of early detection however economic analysis should be undertaken to determine if it provides a positive benefit/cost

7.0 Conclusions

This document outlines recommendations for general protocols and procedures for surveillance for exotic pests for early detection and market access. Specific surveillance plans will be required for each pest (or group of pests with similar biology), that detail the most appropriate type of data collection and number of data points required to provide confidence levels of detection. These plans should be based on factors such as host, pest biology and epidemiology, potential impact to the industry, pathway assessment and complexity of pest or disease symptoms and diagnosis.

Where surveillance is required to support area freedom and/or provide confidence for early detection, it should comprise appropriate statistical rigour. A number of research projects on surveillance strategies for specific grain pests are being developed within the CRCNPB including "Sampling strategies for stored grains, CRCNPB30086" and "Development of biosecurity contingency plans and assessment of data for declaring freedom from EPPs, CRCNPB 30009" which will provide confidence levels associated with sampling protocols. In addition to projects on surveillance strategies, where new methodologies become available through research and development such as remote sensing, use of spore traps, use of PDA technologies to collect data or use of image analysis in stored grain, these should be incorporated within specific surveillance plans.

This document outlined 15 recommendations for provision of a more nationally coordinated surveillance system that makes use of existing programs and activities as well as implementation of new arrangements. These included the requirement for economic analyses to determine if the benefits for targeted and/or passive surveillance outweigh the costs of implementation, maintenance of a nationally coordinated biosecurity program to facilitate data collection and awareness extension and training and development of a national first detector system for identification of key pest threats. Potential sources of passive surveillance data were identified including crop evaluation and research trials, diagnostic services, bulk handling companies and consultants. There is also a need to improve tracking and tracing of grain throughout the supply chain to assist with food safety and biosecurity needs.

In order to implement the National Grains Surveillance Plan, a staged process is recommended which will include:

- Appointment of Grains Biosecurity Officers – through the Grains On-farm Biosecurity Program and in collaboration with state primary industries agencies, appointment of Grains Biosecurity Officers is already underway.
- Identification and training for first detectors – through the CropSafe program in DPI Victoria, first detectors are being identified and trained in Victoria. Using linkages between CropSafe and the Grains On-farm Biosecurity Program, this program will be assessed and commence implementation on a national level in 2009.
- Identification of mechanisms for collection of data – Grains Biosecurity Officers will commence assessment of mechanisms for data collection from passive surveillance in 2009.
- General biosecurity awareness for growers and industry personnel – A communications strategy for the delivery of biosecurity must be developed and implemented.

- Targeted surveillance programs for key pests – specific research projects are underway for pests of stored grain to identify types of sampling and numbers of samples required to provide evidence of absence and confidence levels for early detection. Further plans are required for in-crops pests of production.
- Improved surveillance protocols – research and development is required to make best use of limited resources available for surveillance and improve accuracy and reliability of detection for both in-crop and stored grain pests.

Surveillance activities for key pests are essential for preparedness for, and prevention of, new pest incursions. While historically, targeted surveillance provided sufficient data to define pest occurrence, in recent years, resources for targeted surveillance have decreased through state Departments of Primary Industries. This has made data collection from many disparate sources necessary and a combination of targeted and passive surveillance will provide the best model to achieve aims for both market access and early detection.

To assist passive surveillance, the continued need to promote the importance of biosecurity in protecting grain production and maintaining our export markets throughout the whole grains industry supply chain should be recognised as an integral part of surveillance activities. Implementation of the National Grains Surveillance Plan will assist with these outcomes through a more coordinated and consistent approach to data capture, collation and retrieval, providing a system to reliably ensure early detection of pests occur, and evidence of absence data are available.

8.0 References

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