Development of an Environmental Management System framework chapter for the Australian Nursery Industry Accreditation Scheme

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Development of an Environmental Management System (EMS) framework chapter for the Australian Nursery Industry Accreditation Scheme (NIASA) & the Australian Garden Centre Accreditation Scheme (AGCAS)

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Purpose of report

The Nursery Industry Accreditation Scheme, Australia (NIASA) has provided a blueprint for professional management of production nurseries and growing media suppliers since 1994. Similarly the Australian Garden Centre Accreditation Scheme (AGCAS) supports professionalism of retail nursery businesses.

This project was commissioned by Nursery & Garden Industry Australia (NGIA) to conduct an environmental risk assessment for production nurseries, retail nurseries and growing media suppliers, and develop an environmental management framework chapter for the NIASA Best Management Practice guidelines (for production nurseries and growing media suppliers) and AGCAS Best Management Practice guidelines (for retail nurseries).

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Media Summary

This project was commissioned by Nursery & Garden Industry Australia (NGIA) to conduct an environmental risk assessment for production nurseries, retail nurseries and growing media suppliers, and develop an environmental management framework chapter for the Nursery Industry Accreditation Scheme Australia Best Management Practice guidelines (for production nurseries and growing media suppliers) and the Australian Garden Centre Accreditation Scheme Manual (for retail nurseries).

This initiative by NGIA will serve the Nursery & Garden Industry well as the community becomes more conscious of the need to protect the environment and places more pressure on industries to do likewise. Production nurseries and Garden Centres will now have an opportunity to be recognised for their good environmental practices through their respective industry accreditation schemes.

Introduction

The Australian nursery industry is represented by all states and territories, with the greatest volume of production and retail sales concentrated in the eastern states, and in areas of encroaching urbanisation. Once somewhat removed from residential areas, production nursery businesses are now often in areas of encroaching urbanisation. Garden centres are logically situated close to their customers in or near populated areas.

Increasingly stringent environmental legislation at local, state and federal government levels also adds pressure for nurseries to demonstrate good management that protects the environment. The nursery industry has recently completed an audit of environmental legislation that will impact on nursery businesses. One of the main purposes of the audit was to ensure that NIASA, an industry-owned program for the implementation of best management practice in production nurseries and growing media suppliers, was compliant with relevant environmental legislation.

Following the conduct of the environmental legislation audit NGIA identified that the most appropriate way of promoting environmental compliance in the industry was to add an environmental management chapter to the current NIASA Best Management Practice Guidelines and the AGCAS manual.

Strategy

Environmental risk assessment for nurseries

The main references used for the development of this risk assessment methodology were the Australian/New Zealand Standard AS/NZS 4360:1999 Risk Assessment, and HB 203:2000 Environmental Risk Management – Principles and Process.

Risk is the chance of something happening that will impact on objectives either adversely or beneficially. Risk to the environment can be caused by pressure from human activity or inactivity either directly or indirectly which leads to the loss of environmental sustainability.

Environmental risk arises from the relationship between human activity and the environment and can be grouped into two main categories:

• Risk to the environment;

This type of risk recognises that an organisations activities can cause some form of environmental change. Such as change to flora and fauna; human well-being; earth, air and water resources; energy and climate.

• Risk to an organisation from environmental related issues.

These risks relate to an organisation not complying to current and future legislative requirements. In addition, risks may also relate to losses resulting form poor management, fines, cost of litigation and from failure to secure and maintain permissions for development and operational activities.

Environmental risk assessment process

The process used for the environmental risk assessments were adapted from the following steps identified in HB 203:2000 Environmental Risk Management – Principles and Process.

- Establish the context of the risk assessment.
 - Identify purpose and scope of the risk assessment;
 - Develop process flow charts documented in Appendix 1.
- Identify environmental risks.
 - Documented in Appendix 2 'Environmental risk assessments'.
- Analyse and evaluate environmental risks.
 - Risk analysis is documented in Appendix 2 'Environmental risk assessments'.
 - Risk prioritisation is documented in Appendix 3.
- Manage and communicate risks
 - Documented in Appendix 4 'Environmental Best Management Practice chapter' for production nurseries and growing media suppliers, and Appendix 5 'Environmental Best Management Practice chapter for garden centres.

Purpose and Scope

The purpose of the environmental risk assessments was to conduct a rigorous assessment of potential risks to the environment from nursery operations. The information generated by these assessments provided the basis for developing the Environmental Best Management Practice chapters for the nursery and garden industry.

Environmental risk assessments were conducted for growing media, container and in ground nursery production systems, and garden centre operations within the Australian nursery industry.

Our risk assessment process steps

Step 1: Identify key areas of the environment that nurseries may potentially impact. These were:

- Water quality and use efficiency
- Pesticide and chemical pollution
- Noise, air, odour and visual pollution
- Landscape and wildlife (biodiversity)
- Spread of environmental weeds & other exotic pest organisms
- Managing waste

• Energy efficiencyStep 2: Develop a generic process flow diagram for production nurseries, growing media suppliers and garden centres. Several reference nurseries were visited in South-East Queensland to develop first draft process flow diagrams followed by review and input from industry representatives. The process flow diagrams are documented in **Appendix 1**.

Step 3: Conduct generic environmental risk assessments for production nurseries, growing media suppliers and garden centres. Each process (in the process flow diagrams) was analysed for it's potential to negatively or positively impact on the environmental areas listed in step 1 above.

Step 4: Analyse risks according to potential aspect or cause, potential impact or effect, control measures and monitoring of the risk. The environmental risk assessments are documented in **Appendix 2**

Step 5: Evaluate risk priorities. In an environmental management system, prioritising environmental issues and their impacts is usually done on a business-by-business basis as significance of issues and their causes can vary greatly depending on the individual business situation, and varying local environmental issues and requirements. For this generic industry-wide environmental risk assessment, we felt it was better to glean what are the generally accepted key issues and causes from people who work in and with the industry. We provided them with all potential risks and their causes identified in the risk assessments and asked them to rate according to high, medium or low significance. This information was then collated and used to guide the emphasis we placed on particular issues, causes and the practice options to address them in the Environmental Best Management Practice chapters. The collated information is documented in **Appendix 3**.

Step 6: Manage and communicate risks. In the context of this project, we have used the information generated in the previous steps to guide development of Environmental Best Management Practice chapters for the Nursery and Garden Industry.

Appendix 4 is the Environmental Best Management Practice chapter for production nurseries (including growing media suppliers) and a review checklist. The chapter has been written in a style consistent with the NIASA Best Management Practice Guidelines.

Appendix 5 is the Environmental Best Management Practice chapter for Garden Centres and a review checklist. The chapter has been written in a style consistent with the AGCAS Manual.

The Environmental Best Management Practice chapter for production nurseries has incorporated and referenced relevant material from other best management practice guidelines developed for the nursery industry into one structured document.

Discussion

A brief overview of Environmental Management Systems in Horticulture

Australia's National Framework for Environmental Management Systems (EMS) in Agriculture defines EMS as "a systematic approach that can be used by any enterprise or organisation to continuously improve its business management to achieve efficiencies and better environmental outcomes" (Anon 2002). In the framework's documentation, EMS is described as a voluntary, flexible 'systems approach' that is based on a 'plan, do, check, review' continuous improvement cycle. With respect to nursery production this implies improved nursery production systems together with improved natural resource management outcomes.

Many individual businesses or regional groups have established various levels of EMS for their operations. This brief overview looks at formal EMS's with national or international recognition.

ISO 14001

Currently ISO 14001 is the only internationally recognised certification EMS standard. It is a generic process standard that requires a business to follow a continual improvement management cycle of planning, implementing, monitoring and reviewing activities. ISO 14001 requires the system to be documented and auditable by an accredited third party. It does not dictate levels of environmental performance, rather it more broadly requires businesses to conform to 'legal and other requirements' These may include general environmental laws, authorizations, licenses and permits, and requirements of specific industry organisations or groups.

EurepGAP

EurepGAP is a series of good agricultural practice protocols developed by a European retailer consortium in collaboration with the supply chain. The protocols address various agricultural industries including flowers and ornamentals, and fruit and vegetables. EurepGAP has been operating since the late 1990's and there is increasing interest in this protocol in the Australian horticulture industry, especially those sectors exporting into Europe. The protocols incorporate food safety, environmental management, workplace health and safety and ethical farming considerations. European customers are requiring their Australian suppliers of fruit and vegetables to implement EuropGAP. See www.eurep.org for further information.

Enviroveg

Enviroveg is a protocol-type environmental program initiated by the Australian Vegetable Growers Association. The Enviroveg program outlines principles and practices that should be followed to reduce environmental impacts of vegetable production. The Enviroveg selfassessment tool helps growers compare their current farming practices with the listed activities in the Enviroveg guidelines with information to help them improve environmental performance.

Horticulture Australia Ltd Environmental Assurance Guidelines

These guidelines have been developed to provide guidance to horticultural businesses when developing their EMS's. It is not an accredited EMS, rather it provides information about good environmental practices and a checklist to enable businesses to benchmark themselves against the practices recommended in the guidelines.

Linkages between the Nursery Environmental Management chapters and other EMS initiatives in Australian Horticulture

The Nursery Environmental Best Management Practice chapters are consistent with the Horticulture Australia Ltd Environmental Assurance Guidelines. The main environmental issues are covered under similar headings although Land and Soil (included in the HAL guidelines) is not included in the nursery guidelines. Soil erosion issues are addressed under the 'Managing water' section of the nursery guidelines as they contribute to wastewater pollution.

The Production Nursery chapter incorporates some environmental components from the EurepGAP protocol (Flower and Ornamentals), particularly the requirement for a native vegetation and wildlife conservation plan for the site in Section 4.8 of the NIASA Accreditation Checklist – Environment (production nurseries) in Appendix 4. Other components addressed in both the EurepGAP protocol and the Production Nursery and (to some extent) the Garden Centre chapters include storage and handling of pesticides, soil erosion control, substrate (growing media) management, fertiliser management, waste management and energy efficiency.

The nursery environmental chapters do not expressly require businesses to adopt the continuous improvement management cycle that is strongly encouraged in ISO 14001. However, the Accreditation Checklists do encourage a business to review their operation regularly, and as part of the NIASA and AGCAS schemes will ensure regular external assessment of their operations and conformance to the environmental guidelines.

Environmental legislation

There are a large number of Federal and State Acts covering most aspects of the environment. Some Acts such as the Federal Environmental Protection & Biodiversity Conservation Act 1999, and State/Territory Acts addressing environmental protection place a general environmental duty of care on all members of the community. Local authorities regulate many of the State/Territory Acts, but State Environmental Protection Agencies can be active in pursuing environmental pollution issues, and State Natural Resource Departments regulate resource issues such as vegetation management, soil and salinity issues and water allocations.

As all levels of government are increasingly regulating to ensure good environmental outcomes, nursery and garden centre businesses need to be aware of what is 'over the horizon' and take steps to meet these future demands.

A section on environmental legislation and regulation has been included in both the Production Nursery and Garden Centre chapters.

Regional natural resource management initiatives

Under the National Action Plan for Salinity and Water Quality and Natural Heritage Trust 2 Commonwealth Government initiatives, regional community-based natural resource management (NRM) bodies, or Catchment Management Authorities, have been established in all regions of Australia. They have the responsibility of developing integrated NRM plans for their region (includes setting environmental targets), communicating and liaising with regional communities and administering funded activities to facilitate implementation of the integrated NRM plans.

Regional nursery industry groups may wish to contact their regional NRM bodies to inform them of the Nursery Industry Environmental Best Management Practice chapters (when published) and explore how they may be incorporated into regional NRM planning.

Recommendations

- Develop an awareness training program for Nursery and Garden Centre Industry Development Officers on the Environmental Best Management Practice chapters.
- Test (or ground-truth) the practicality of the Environmental Best Management Practice chapters and Accreditation Checklists with some case study production nurseries and garden centres, then review and improve them.
- Prepare fact sheets or 'Nursery Papers' outlining the key components of the Environmental Best Management Practice chapters for both production nurseries and garden centres to raise awareness of them within the industry.
- That NIASA and AGCAS managers encourage nurseries, growing media suppliers and garden centres to use the environmental Accreditation Checklists to conduct regular self-assessments or audits of their business.

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Appendix 1

PROCESS FLOW DIAGRAMS

- CONTAINER PRODUCTION NURSERIES
- IN GROUND PRODUCTION NURSERIES
- GROWING MEDIA SUPPLIERS
- RETAIL GARDEN CENTRES

Production Nursery - Container production



Production Nursery - In Ground Production



Growing media production



Retail Garden Centre Systems



APPENDIX 2

ENVIRONMENTAL RISK ASSESSMENTS

- **GROWING MEDIA SUPPLIERS**
- CONTAINER PRODUCTION NURSERIES
- IN GROUND PRODUCTION NURSERIES
- RETAIL GARDEN CENTRES

DEFINITIONS

Significance	What is the significance of the hazard? This is rated as either low, medium or high.
Process Flow Chart	A systematic representation of the sequence of processes (steps or operations) used in a growing media production system.
Environmental Risk Assessment Plan	A logical and systematic method of establishing the context, identifying, analysing, evaluating, treating, monitoring and communicating risks associated within a process that will enable organisations to minimise losses and maximise opportunities.
Risk	The chance of something happening that will have an impact on the environment.

RISK ASSESSMENT TABLE – GROWING MEDIA PRODUCTION SYSTEM

Process	Potential Aspect/Cause	Potential Impact/Effect	Control measure	Monitoring
Sourcing raw materials: - Bark	Sourcing bark from old- growth native forests	Loss of native forests & associated ecosystems & habitats.	Policy of sourcing only from renewable cultivated forestry areas/businesses.	Review approved suppliers
- Other materials	Noise from delivery of products (eg: vehicle noise)	Noise pollution disturbed neighbours complaints	Assess risk of neighbour disturbance to determine level of actions required. Policy of delivery within acceptable hours (local authority guidelines/laws).	Noise monitoring where needed
	Unloading.	Dust (air & visual pollution) complaints	Assess risk of neighbour disturbance to determine level of actions required. Water down during unloading.	Dust monitoring where needed
	Sourcing materials other than bark.	Loss of source ecosystems (eg: sand from stream beds)	Assess environmental risk of sourcing. Source from non-disruptive/polluting suppliers.	
	Sourcing materials	Odour, dust (eg: from fowl manure)	Avoid sourcing risky products. Use covered storage (eg: tarpaulins, sheds, silo's).	Dust and odour monitoring where needed
	contaminated with weed seeds & propagules.	Environmental weed spread	Assess source for weed contamination & reject if high risk. Follow correct composting procedure.	Check process
Aging raw materials	Surface water runoff from heaps	Pollution of off-site waterways & wetlands (tannins, BOD, nutrients)	Prevent runoff from site: holding dams. Recycle water (for composting and dust suppression). Treat water before release – artificial wetlands, reverse osmosis, aeration.	Regular water quality testing
	Holding dam water.	Odour	Assess risk of neighbour disturbance to determine level of actions required. Add chlorine to control odour (no good for wetlands).	Odour monitoring if needed

Process	Potential Aspect/Cause	Potential Impact/Effect	Control measure	Monitoring
Aging raw materials (contd)	Water from heaps leaching into sub-surface ground water	Pollution of ground water (tannins, nutrients)	Select impervious soils for storage area. Use a water barrier between raw material heaps & soil, and sealed drainage to holding dams.	
	Storage.	Air pollution – odour.	Assess risk of neighbour disturbance to determine level of actions require: Implement neighbour awareness program. Avoid storing smelly materials. Covered storage (tarpaulins, sheds, silos)	Odour monitoring if needed
		Air pollution – dust	Assess risk of neighbour disturbance to determine level of actions required. Implement neighbour awareness program. Water down heaps regularly. Covered storage.	Dust monitoring if needed
		Visual/aesthetic pollution	Assess risk of neighbour disturbance to determine level of actions required. Screen the area - Eg: trees, fences, mounds. Limit heap height.	

Process	Potential Aspect/Cause	Potential	Control measure	Monitoring
Grading and mixing	Loading, grading & unloading	Noise pollution	Assess risk of neighbour disturbance to determine level of actions required. Select appropriate sized machinery and equipment. Reduce noise of machinery & equipment (silencers, baffling etc). Limit activity to appropriate time of day/night Limit length of each activity session	Noise monitoring if needed
		Dust & odour pollution	Assess risk of neighbour disturbance to determine level of actions required. Water down during loading & unloading.	Dust & odour monitoring if needed
	Fuel & oil storage, use, spills.	Soil and water pollution	Use appropriate storage facilities. Appropriate handling of fuels & oils. Emergency response plan & equipment for spills and accidents.	Review emergency response plan
	Waste from vehicles and equipment: Used fuel containers, oil & oil containers, tyres, batteries, mechanical components	Waste pollution Water & soil pollution Visual pollution Off-site landfill issues	Develop & implement a waste management plan: Avoid, reduce, recycle or re-use waste. Use recycle/re-use contractors. Use electrical motors rather than internal combustion motors if feasible. If stored, store in an allocated, screened area, separate recyclables from land fill waste.	Review waste management plan
Composting	Water runoff and infiltration.	See "Aging raw materials" section.	See "Aging raw materials" section.	

Process	Potential Aspect/Cause	Potential	Control measure	Monitoring
	_	Impact/Effect		_
Composting (contd)	Storage & handling of fertilisers and other additives. Fertiliser &	Pollution of waterways, soil and ground water.	Appropriate fertiliser storage and handling. Emergency response plan & equipment.	Review emergency response plan
	additive spills.	Packaging waste	Waste management plan. (See "grading & mixing" section)	Review waste management plan
	Compost heaps visible.	Visual/ aesthetic pollution.	Screening. Appropriate size and style of heaps.	
	Compost components infested with environmental weeds.	Environmental weed spread	Source weed-free components Ensure compost heaps are subjected to temperature X time regime to kill weed seeds.	Inspect materials Check process
	Waste from vehicles and equipment	Waste pollution	Waste management plan. (See "grading and mixing" section).	Review waste management plan
Drying	See 'Aging raw materials" section			
Mixing batches	Sourcing sand.	Streambed disruption. Sedimentation of waterways	Policy of only sourcing from non-streambed sources. Avoid use of sand.	Review approved suppliers
	Nutrient loss in water runoff	Surface water pollution	See "Aging raw materials" section.	
		Groundwater pollution	See "aging raw materials" section.	
	Waste from vehicles, equipment, fertiliser & other ingredient packaging.	Waste pollution	Waste management plan. (See "grading & mixing" section)	Review waste management plan

Process	Potential Aspect/Cause	Potential Impact/Effect	Control measure	Monitoring
Despatch	Transport vehicles	Noise pollution	Assess risk of neighbour disturbance to determine level of actions required. Policy of delivery within acceptable hours (local authority guidelines/laws).	Noise monitoring if needed
	Loading	Dust (air & visual pollution) complaints	Assess risk of neighbour disturbance to determine level of actions required. Maintain moist media.	Dust monitoring if needed
	Left-over media residue.	Water pollution	Limit media spillage during loading and despatch. Do not allow waste media to leave the mixing area. Collect & recycle, re-use spilled media	
Site maintenance	Clearing remnant & riparian vegetation	Loss of biodiversity	Retain remnant and riparian vegetation	
	Environmental weeds growing on-site – seeds & other propagules infesting aging & compost heaps.	Spread of environmental weeds	Control weeds on-site Correct compost process (time X heat X mixing) to kill weed seeds & other propagules.	Regularly inspect for weeds. Check compost process
	Exotic pest organisms (other than weeds) harbouring on-site being distributed with despatched loads	Spread of exotic pest species	Control exotic pests on-site. Correct composting process to kill or exclude exotic pests from media heaps.	Regularly inspect for exotic pests. Check compost process

RISK ASSESSMENT TABLE – PRODUCTION NURSERY SYSTEM (CONTAINER PRODUCTION)

Process	Potential Aspect/Cause	Potential Impact/Effect	Control measure	Monitoring
Source potting media	See "Potting Media Production"			
Prepare/store potting media	See "Potting Media Production"			
Sterilise potting media	Steam pasteurisation: Waste oil & grease. Waste machinery parts.	Waste generation	Appropriate waste management (avoid, reduce, re-use, recycle). Use electric motors Cf internal combustion.	Review waste management plan
	Storage spills (oil, grease, fuel).	Soil, water pollution	Appropriate storage of oils, grease & fuels.	
Source & store propagation containers	Disposal of used plastic containers and packaging materials.	Plastic waste Packaging waste (burning=air pollution Burying=soil/water pollution).	Source alternative biodegradable containers Appropriate waste management (avoid, reduce, re-use, recycle). Do not burn or bury.	Review waste management plan
	Inappropriate re-use of plastic containers by consumer	Contamination of environment (wildlife, contribution to landfill, landscape/visual pollution).	Source, use & sell biodegradable containers.	
	Poor storage of containers (siting, arrangement)	Visual pollution	Enclosed storage. Effective storage management. Store away from public areas. Screen storage area.	Check storage areas

Process	Potential Aspect/Cause	Potential	Control measure	Monitoring
		Impact/Effect		
Source & store propagation containers (cont)	Source 2nd-hand containers infested with weed seeds.	Spread environmental weeds.	Source only new, clean &/or sterilised containers	Inspect containers
Fill containers	Waste media washed into waterways.	Waterway contamination (BOD, nutrients, visual).	Appropriate storage and use of media, & re-use of waste media. (eg: concrete storage area for waste).	Check storage areas
media	Leachates from waste heaps (exposed to weather).	Waterway and sub-surface water contamination (BOD, nutrients, visual),	Appropriate storage & re-use of waste media.	
	Machinery operation	Waste machinery parts. Noise pollution.	Waste management. Operate during daylight hours only. Use noise-reducing methods on motors.	Monitor noise if needed.
		Air pollution from machinery emissions	Implement emission controls on motors.	
Sourcing the planting stock	Selecting species regulated or recognised as noxious weeds.	Spread of noxious weeds	Check National, State & local regulations. Get approvals before sourcing if relevant.	Check local authority regulations
	Sourcing stock contaminated by insect or animal pests, diseases, weeds or weed seeds.	Spread of exotic insect/animal pests, diseases, weeds.	Only source from approved suppliers (government, industry or business). Quarantine treatments.	Visual arrival inspection.
	Sourcing & propagation of GMO stock.	Spread of unacceptable GMO's.	Ensure GMO meets National, State & local government regulations before sourcing.	
	Sourcing stock removed from National Parks, reserves & sensitive areas.	Depletion of native biodiversity, threatened species, ecosystems	Only source from approved suppliers. Conform to regulations in sourcing State.	Approved supplier status

Process	Potential Aspect/Cause	Potential Impact/Effect	Control measure	Monitoring
Planting the stock	Automated machinery: Stock packaging and used containers	Waste machinery parts, oils, grease, packaging, used containers.	Waste management.	Review waste management plan
	Oil, grease, fuel leaks, spills.	Water & soil contamination.	Appropriate storage. Maintenance of machinery & equipment.	
		Noise pollution	Timing and duration, use noise-reducing methods, electric motors.	Noise monitoring if needed
		Air pollution (fumes)	Emission control, electric motors.	
Irrigation & Fertigation	Sourcing and use of water.	Depletion of water source.	Comply with water allocations where relevant. Use efficient irrigation system.	Monitor water use
			Collect & re-cycle excess water.	Monitor irrigation water quality
	Nutrient & water runoff & leaching	Nutrification of waterways and sub-surface water	Nutrient budgeting. Efficient irrigation to reduce runoff. Collect, treat and recycle water runoff. Use sealed drains to collect water runoff Water barrier under pots to prevent leaching.	Monitor wastewater quality.
	Soil loss from irrigation runoff/ irrigation line leaks and blowouts	Nutrification & sedimentation of waterways.	As above plus: Irrigation line maintenance. Maintain soil cover to prevent erosion.	
	Pumps	Waste (oil, grease, pump parts)	Waste management	Review waste management plan
		Oil, grease, fuel leaks & spills	Pump maintenance Appropriate storage of oils, grease, fuel.	
		Noise pollution	Timing & duration of operation, siting, noise reduction.	Noise monitoring if needed

Process	Potential Aspect/Cause	Potential Impact/Effect	Control measure	Monitoring
Irrigation &		Air pollution	Emission controls	
(continued)	Pump placement if pumping from watercourse	Soil erosion. Loss of riparian vegetation	Limit disturbance to vegetation when installing pump & electricity supply (if relevant.	
	Used irrigation lines	Waste	Waste management	Review waste management plan
Pest, disease, weed control	Off-target pesticide application /drift	Water & soil pollution. Threat to wildlife, fish. Landscape pollution.	 Appropriate use of pesticides: Follow label directions. Apply under proper environmental conditions. Maintain & calibrate sprayer regularly. Use trained operators. Establish buffer zones/barriers between business and neighbours. 	Spray records
	Plant & equipment use	Spray unit waste Noise pollution Air pollution– fumes from tractors, backpack units.	Waste management Timing & duration of use, baffles. Buffer zones/barriers	Noise & air monitoring if needed
	Chemical spills, leaks in storage and handling.	Water & soil pollution. Threat to wildlife, fish. Landscape pollution.	Appropriate storage and inventory maintenance. Spill kit in place.	Check storage area regularly
	Used pesticide containers	Above + waste	Waste management. Disposal according to government guidelines. (eg: AgSafe, Drummuster)	Review waste management plan
	Ineffective treatment.	Spread of environmental pests, diseases, weeds	Trained operators, properly maintained equipment, use IPM principles.	
	Over-use of pesticides	Water & soil pollution. Threat to wildlife, fish. Landscape pollution	Use IPM principles plus adopt a pest resistance strategy.	Review pest management program

Process	Potential Aspect/Cause	Potential	Control measure	Monitoring
Growing Environment	Boilers, heaters, air-	Waste	Waste management.	Review waste
control		Noise pollution	Siting, noise suppression devices.	indiagononi plan
- Humidity - Glasshouse		Air pollution – fumes	Scrubbers, electric vs internal combustion motors.	Noise, air monitoring if needed
- Lighting	Lighting	Visual pollution	Screening. Structure design & siting.	
	Glasshouse/shadehouse	Visual pollution	Screening, structure design & siting.	
		Waste – glass, cloth, framework,	Waste management.	Review waste management plan
	Glasshouse: runoff from roof.	Soil erosion	Guttering & downpipes installed, Constructed/grassed drains, soil cover around eaves area, siting.	
Growing structures/ systems - Buildings, - benches	Replacement & maintenance	Toxic materials into environment (asbestos, tar sheeting, lead capping etc)	Store/dispose according to regulations.	
- bays & beds		General waste – bricks, iron, glass, sheeting, plastic etc	Waste management.	Review waste management plan
Pruning	Prunings	Waste foliage	Compost, recycle (take into account leaf disease issue).	Review waste management plan
Growing Maintenance & management of facility	Growing structures	See previous		

Process	Potential Aspect/Cause	Potential Impact/Effect	Control measure	Monitoring
- office, staff & storage	Office building & staff	Office waste Food & food packaging waste	Waste management.	Review waste management plan
	Leaking sewers	Sewerage waste Water contamination	Link with council sewer system. If septics, siting & measures to avoid contamination of water. Private	
Gardens & Lawns	Refer to fertilisation /irrigation, pest, disease, weed control			
	Mowing, edging, slashing	Noise from mowing, edging	Timing, duration, noise suppression.	Noise monitoring if
		Lawn clippings	Compost & re-cycle as mulch.	needed.
Water recycle ponds	Overflow, leak, leaching	Nutrient, chemical contamination of waterways & groundwater	Design & management	
Traffic ways	Unsealed or unstabilised	Soil erosion & sediment into waterways	Seal traffic ways with bitumen , concrete, gravel. Grass traffic ways if light traffic. Adequate drainage from traffic ways.	
		Dust	Seal traffic ways as above. Water down traffic ways regularly if not sealed.	
Vehicles & Equipment	Repairs & maintenance	Waste parts, oils, batteries etc	Waste management.	Review waste management plan
	Use	Noise	Timing, duration, suppression.	Noise, air monitoring if
		Air pollution – fumes	Scrubbers, electric motors, alternative vehicles.	needed.

Process	Potential Aspect/Cause	Potential	Control measure	Monitoring
		Ιπραςτ/Επεςτ		
Equipment (cont)		Soil erosion, dust	Drive on allocated, sealed roadways. Observe speed limits. Appropriate vehicle selection.	Dust monitoring if needed
		Energy use	Appropriate vehicle selection.	
Biodiversity (If significant native vegetation &/or wildlife on property)	Landscape & wildlife management	Loss of biodiversity and habitat for native plant & animal spp. Loss of wildlife corridors Threats to protected species.	Retain areas of remnant native vegetation. Program of replanting native vegetation. Retain or replant riparian vegetation. Conduct species assessment (Parks & Wildlife staff). If threatened species identified, initiate program of protection. Non-destructive native pest control measures (netting, birdscarers etc).	Review conservation plan
	Noxious weeds or feral animals not controlled	Spread of noxious weeds; increase in feral animals.	Monitor & initiate/increase control measures as required.	Monitor noxious weeds and feral animals
Re-potting	See "Filling containers" & "media production"			
Transport to despatch area	Vehicle use	See "Maintenance & management of facilities".		
Detailing & labelling	Foliage waste Label packaging	See "pruning" Waste	Waste management	Review waste management plan
Packaging	Contaminated, infested packaging	Spread of pests, diseases, and weeds.	Approved package supplier program. Treat/check if using recycled packaging	Despatch check
	Sourcing packaging	Loss of native forests & wildlife habitat	Use re-cycled materials. Approved supplier program.	

Process	Potential Aspect/Cause	Potential Impact/Effect	Control measure	Monitoring
Packaging (cont)	Reject packaging, strapping, plastic covers etc.	Waste	Waste management	Review waste management plan
Despatch	Vehicles & forklifts	Noise Spread of pests, diseases	Timing of despatch. Quarantine despatch area.	Despatch check
		& weeds on vehicles in & out of business.		

ENVIRONMENTAL RISK ASSESSMENT -- IN-GROUND NURSERY PRODUCTION

RISK ASSESSMENT TABLE – PRODUCTION NURSERY SYSTEM (IN GROUND PRODUCTION)

Process	Potential Aspect/Cause	Potential Impact/Effect	Control measure	Monitoring
Source & store planting stock	Selecting species regulated as noxious weeds.	Spread of noxious weeds	Check National, State & local regulations. Get approvals before sourcing if relevant.	Check latest regulations with NGIA
	Sourcing stock contaminated by insect or animal pests, diseases, weeds or weed seeds.	Spread of exotic insect/animal pests, diseases, weeds.	Only source from approved suppliers (government, industry or business). Quarantine treatments.	Review approved suppliers
	Sourcing & propagation of GMO stock.	Spread of unacceptable GMO's.	Ensure GMO meets National, State & local government regulations before sourcing.	
	Sourcing stock removed from National Parks, reserves & sensitive areas.	Depletion of native biodiversity, threatened species, ecosystems	Only source from approved suppliers. Conform to National regulations and regs in sourcing State.	Review approved suppliers
Source & store growing additives	Inappropriate storage. Spills, leaks.	Pollution of surface & ground water, soil.	Appropriate storage. Emergency procedures for spills.	
dolomite, gypsum, growth hormones, etc)	Fertiliser selection	Reduced soil health (acidification, salinisation, reduced soil biodiversity)	Select least damaging forms. Organic vs inorganic fertilisers?	Soil test
Prepare site for planting	Cultivation	Exposed soil rerosion rediment & nutrients into waterways	Minimum tillage, soil conservation measures.	
		Soil health degradation	Minimum or 'soft' tillage.	
		Spread of environmental & pest weeds.	Monitor area before cultivation. Note & avoid cultivation of areas infested with environmental weeds. Isolate and kill weeds.	Check site for weeds

ENVIRONMENTAL RISK ASSESSMENT –IN-GROUND NURSERY PRODUCTION

Process	Potential Aspect/Cause	Potential	Control measure	Monitoring
Prepare site for planting	Cultivation (cont)	impacaEnect	Check & clean cultivation equipment before moving to other sites.	Check equipment
	Soil fumigation	Destroys soil biodiversity Air pollution	Avoid fumigation if possible. Correct application technique.	
	Machinery use.	Noise pollution	Timing & duration of operation, siting, noise reduction.	Monitor noise if needed.
		Air pollution (dust).	Cultivate moist soil. Avoid windy days, note wind direction.	Monitor dust if needed.
		Waste – machinery parts, oil, grease, batteries etc.	Waste management.	Review waste management plan
	Landscape & wildlife management	Clearing native vegetation, loss of biodiversity, wildlife corridors & habitat.	Retain remnant vegetation. Initiate replanting program. Retain or replant riparian vegetation.	
Plant stock	Vehicles & machinery	Waste – machinery parts, oils, batteries etc	Waste management.	Review waste management plan
	Stock packaging and used containers	Waste containers	Waste management	
Irrigation	Sourcing and use of water.	Depletion of water source.	Comply with water allocations where relevant. Use efficient irrigation system. Collect & re-cycle excess water.	
	Nutrient & water runoff & leaching	Nutrification of waterways and sub-surface water	Nutrient budgeting. Efficient irrigation to reduce runoff. Collect, treat and recycle water runoff. Use sealed drains to collect water runoff	Test wastewater
ENVIRONMENTAL RISK ASSESSMENT –IN-GROUND NURSERY PRODUCTION

Process	Potential Aspect/Cause	Potential	Control measure	Monitoring
Irrigation (cont)	Soil loss from irrigation runoff/ irrigation line leaks and blowouts	Nutrification & sedimentation of waterways.	As above plus: Irrigation line maintenance. Maintain soil cover to prevent erosion.	
	Pumps	Waste (oil, grease, pump parts)	Waste management	Review waste management plan
		Oil, grease, fuel leaks & spills	Pump maintenance Appropriate storage of oils, grease, fuel.	
		Noise pollution	Timing & duration of operation, siting, noise reduction.	Monitor noise if needed
		Air pollution	Emission controls	
	Pump placement if pumping from waterway	Soil erosion. Sediment into waterway. Loss of riparian vegetation	Limit disturbance to vegetation when installing pump & electricity supply (if relevant.	
	Used irrigation lines	Waste	Waste management	Review waste management plan
Rest, weed, disease control;	Same as for production nursery			
Growing	Inter-row management	Soil erosion	Establish & maintain soil cover in inter-rows (sod, mulch)	
	Landscape & wildlife management	Loss of biodiversity and habitat for native plant & animal spp. Loss of wildlife corridors Threats to protected species.	Retain areas of remnant native vegetation. Program of replanting native vegetation. Retain or replant riparian vegetation. Conduct species assessment (Parks & Wildlife staff). If threatened species identified, initiate program of protection. Non-destructive native pest control measures (netting, birdscarers etc).	Review conservation plans

ENVIRONMENTAL RISK ASSESSMENT –IN-GROUND NURSERY PRODUCTION

Process	Potential Aspect/Cause	Potential Impact/Effect	Control measure	Monitoring
Growing (cont)	Noxious weeds or feral animals not controlled	Spread of noxious weeds; increase in feral animals.	Monitor & initiate/increase control measures as required.	Regular checks
Maintenance & management of facility	Office building & staff Leaky sewer	waste Sewerage waste Water contamination	Waste management. Link with council sewer system. If septics, siting & measures to avoid contamination of water. Private treatment dam.	Review waste management plan
Gardens & Lawns	Refer to fertilisation /irrigation, pest, disease, weed control in potted plants.			Manifer pairs if
	Mowing, edging, slashing	Noise from mowing, edging Lawn clippings	Timing, duration, noise suppression. Compost & re-cycle as mulch.	needed
Water recycle ponds	Overflow, leak, leaching	Nutrient, chemical contamination of waterways & groundwater	Design & management	
Traffic ways	Unsealed or unstabilised	Soil erosion & sediment into waterways	Seal traffic ways with bitumen, concrete, gravel. Grass traffic ways if light traffic. Adequate drainage from traffic ways	
		Dust	Seal traffic ways as above. Water down traffic ways regularly if not sealed.	Dust monitoring if needed
Vehicles & Equipment	Repairs & maintenance	Waste parts, oils, batteries etc	Waste management.	Review waste management plan
	Use	Noise	Timing, duration, suppression. Scrubbers, electric motors, alternative vehicles.	Noise monitoring if needed

ENVIRONMENTAL RISK ASSESSMENT -IN-GROUND NURSERY PRODUCTION

Process	Potential Aspect/Cause	Potential	Control measure	Monitoring
Vehicles & Equipment		Air pollution – fumes	Scrubbers, electric motors, alternative vehicles	
		Soil erosion, dust	Drive on allocated, sealed or grassed traffic ways. Observe speed limits. Appropriate vehicle selection.	
	Oil, grease spills in storage	Soil & water pollution	Appropriate storage	
		Energy use	Appropriate vehicle selection.	
Prepare site for harvest	Regular root trimming	Soil erosion Soil compaction	Limit amount of traffic	
	Water jetting	Sedimentation of waterways	Limit amount of water used. Prevent runoff.	
	Foliage trimming	Foliage waste	Compost & re-cycle.	
	Machinery & vehicles	Waste Noise Air pollution (dust)	Waste management. Noise suppression. Moisten soil	
Harvest	Equipment & machinery	Waste Noise Air pollution (dust)	Waste management Noise suppression. Moisten soil before harvest	
Transport to despatch	Same as for starter/mature potted plants			
Detailing & labelling	Same as for container nurseries + Balling of roots			
Despatch	Same as for container nurseries			

RISK ASSESSMENT TABLE – RETAIL GARDEN CENTRES

Process	Potential Aspect/Cause	Potential Impact/Effect	Control measure	Monitoring
Source stock	Contaminated stock – environmental weeds, insect pests, diseases, pest animals, amphibians etc	Spread of environmental weeds, insect pests, diseases, pest animals, amphibians etc.	Only source from approved suppliers (government, industry or business). Apply quarantine treatments.	Review approved suppliers
	Sourcing from National Parks, native plant reserves etc	Loss of biodiversity.	Only source from approved suppliers. Conform to National regulations and regs in sourcing State.	
	GMO stock	Unacceptable or illegal spread of GMO plants.	Ensure GMO meets National, State & local government regulations before sourcing	
	Propagating plant species listed as environmental weeds	Spread of environmental weeds leading to loss of biodiversity	Check National, State & local regulations. Get approvals before sourcing if relevant	Check with local authority or NIDO's
Receival of stock	Vehicle movement and Forklift use	Dust generation	Sealed delivery area and entrance roads	
		Soil erosion	As above	
		Noise	Operate during daylight hours only. Use mufflers etc on motors. Barriers around property boundary (fences, trees).	Monitor noise if needed
		Air pollution (vehicle emissions).	Implement emission controls on motors.	
	Plant stock spills	Waste media (with nutrients & pesticides) lost to waterways	Careful handling, spill cleanup procedure, do not hose spilled media into drains.	

Process	Potential Aspect/Cause	Potential Impact/Effect	Control measure	Monitoring
Watering	Watering newly arrived stock	Leaching nutrients from pots, nutrification of waterways.	Do not overwater, collect and recycle water.	Monitor water use
		Pesticides into waterways	Agreement with supplier not to apply pesticides & granulated herbicides just before delivery.	Check pots on arrival
Transporting stock around centre	Media spills	Waste media (with nutrients & pesticides) lost to waterways	Careful driving, carting and plant handling, spill cleanup procedure, do not hose spilled media into drains.	Oh o oly fan dwat
	Vehicle, forklift movement	Dust generation	Sealed roadways and display areas	affecting
		Vehicle emissions (affecting neighbours and customers)	Vehicle maintenance schedule, emission controls in place.	holghiocalo
		Noise (affecting neighbours & customers)	Limit activity to daylight hours and minimal customer activity, maintenance, mufflers.	Monitor noise if needed
		Visual pollution (affecting customer experience)	Appropriate vehicle/cart selection, maintenance of vehicles/carts	
		Customer collisions	Careful driving/carting, staff training.	
Saleable plant display & maintenance	Detailing	Waste from pruning, rejects.	Recycle, compost.	
	Irrigation/watering: - excess water use	Depletion of water resource	Comply with water allocations where relevant. Use efficient irrigation system. Collect & re-cycle runoff water.	Monitor water use
	- Pumping water	Pump noise affect on neighbours/customers.	Timing & duration of operation, siting, noise reduction.	Monitor noise if needed
	Fertilising. Spills & leaks from stored fertiliser.	Nutrification of waterways and sub-surface water.	Fast turnaround of stock to avoid need for fertiliser. Avoid fertiliser spills & leaks	water

Process	Potential Aspect/Cause	Potential Impact/Effect	Control measure	Monitoring
Saleable plant display & maintenance (cont)	Pest, disease, weed control. Spills & leaks from stored pesticides & used pesticide containers. Inappropriate disposal of leftover pesticide spray and washings from spray unit after use	Pesticides into the environment	Avoid use of pesticides if possible. Hand weed if needed. Agreement with supplier not to apply pesticides &granulated herbicides just before delivery. Use non-chemical insecticides & fungicides if needed. Suitable storage areas for pesticides. Staff training in pesticide handling.	Review pest management. Check pots on arrival.
	Display benches, facilities & materials	Embedded pollutants in display materials (eg: CCA- treated pine)	Avoid use of materials embedded with pollutants if possible.	
		Waste from deteriorated and refurbished materials.	Waste management	Review waste management plan.
Disposal of unsold stock	Reject plants, media, labels, supports, pots	Waste generation Contribution to landfill	Waste management strategy (reduce, re-use, recycle, discount sales, give away to schools etc.)	Review waste management plan.
Sale of stock	Customer movement	Noise and headlights from customer cars affecting neighbours	Location of carpark, fence/tree barriers on property or carpark boundary.	
		Dust from customers' cars	Sealed carpark.	
	Packaging and containers given to customers (plastic bags, pots, trays)	General community waste. Contribution to landfill. Affect on environment (eg:marine animals and birds)	Reduce packaging Provide recyclable packaging Provide advice/support/services to customers for recycling. (eg: recycling bins for pots at front of nursery centre)	Review waste management plan.

Process	Potential Aspect/Cause	Potential Impact/Effect	Control measure	Monitoring
Site maintenance	Office, staff & storage	Office waste Food & food packaging waste	Waste management	Review waste management plan.
	Gardens & Lawns	Pesticides into environment	Minimise pesticide use, use according to label, use registered pesticides, correct storage of pesticides, correct disposal of used pesticide containers and leftover pesticide spray & washings.	Review pest management plan & waste management plan.
		Nutrients into environment	Use slow release fertilisers for lawns & gardens, avoid over fertilising, collect and treat or recycle runoff from garden areas.	Monitor runoff water quality.
		Noise from lawn mowers and other equipment	Only use during the day, select appropriate equipment.	Monitor noise if needed.
	Display ponds harbouring pest weeds, cane toads, noxious exotic fish etc	Spread of pest organisms into environment	Don't stock with pest organisms, control pest organisms, regular monitoring & maintenance	Check ponds regularly
	General waste from all sections of the business	Contribution to landfill	Waste management strategy (reduce, reuse, recycle)	Review waste management
	Clearing remnant or riparian vegetation	Loss of biodiversity	Retain remnant & riparian vegetation, replant riparian vegetation if absent.	plan.
	Unsightly structures, equipment, vehicles, waste storage areas in view of customers & neighbours	Visual pollution	Select appropriate structures, vehicles & equipment & maintain in good condition. Site storage areas away from customer areas. Construct visual barriers around storage areas.	

APPENDIX 3

Summary of prioritised environmental risks and causes

Environmental Issues	Potential Causes
1. Pesticides (insecticides, fungicides, herbicides, rodenticides,	1. Off-target pesticide application and drift.
plant growth regulators, molluscicides etc.)	2. Pesticide spills & leaks from storage & mixing areas.
	3. Over-use of pesticides.
	4. Inappropriate disposal of left-over pesticide from spraying.
	5. Leaks of residual pesticide from used pesticide containers.
	6. Poorly managed soil fumigation.
	7. Herbicides applied to pots just before sale & distribution.
	8. Insecticides/Fungicides etc. applied to pots just before sale &
	distribution.
	9. Rodenticides washed into drains & streams
2. Depletion of water source	1. Not recycling water.
	2. Inefficient irrigation.
	3. Over-use of water allocation for irrigation.
3. Off-site water pollution from: nutrients and organic matter	1. Storm/rain runoff.
	2. Waste growing media washed into drains and streams.
	3. Fertigation/irrigation runoff.
	4. Overflow, leaks, leaching from water recycle ponds/dams.
	5. Leachates from waste heaps (growing media etc).
	6. Leaking or inappropriately positioned septic systems.
	7. Leachates/losses from growing media storage.
	8. Spills of top-dressed controlled release fertiliser from fallen pot plants,
	washed into drains.
	9. Spills & leaks from stored fertilisers.
	10. Irrigation line blowouts and leaks.
	11. Vehicle wash down (after delivery of growing media or raw materials)

Environmental Issues	Potential Causes
4. Spread of exotic pest weeds, insects, diseases, animals,	1. Sourcing planting stock contaminated/infested with exotic pests.
amphibians, slugs, snails, Genetically Modified Organisms (GMO's)	2. Sourcing or sending packaging contaminated or infested with exotic
etc.	pests.
	3. Ineffective treatment or lack of a program to control weeds and
	environmental weeds in plant stock, stock containers and around property.
	4. Sourcing infested second-hand containers.
	5. Ineffective treatment or lack of a program to control exotic pests (other
	than weeds) in plant stock, stock containers and around property.
	6. Propagating stock species regulated as noxious plants.
	7. Spread of weeds and environmental weeds on vehicles entering &
	leaving the property.
	8. Spread of exotic pest organisms (other than weeds) on vehicles
	entering & leaving the property.
	9. Sourcing & propagating illegal GMO stock.
5. Waste generation	1. Glass, shade cloth, weed mat, plastic, polycarbonate shading,
	framework from replaced growing houses.
	2. Waste growing media and reject plants.
	3. Replaced irrigation lines.
	4. Used pesticide and chemical containers.
	5. Plastic pot sales to customers & subsequent waste problem.
	6. Waste oil, grease, batteries, tyres, machinery parts etc from: steriliser,
	potting & planting machinery, pumps, spraying equipment, boilers,
	heaters, vehicles, farm machinery for in-ground production.
	7. Used planting trays/pots & new tray/pot packaging.
	8. Waste trom returbished growing areas, benches.
	9. Waste toliage from pruning of plant stock & gardens.
	10. Septic sewerage waste.
	11. Stock detailing & labelling waste.

Environmental Issues	Potential Causes
Waste generation (continued)	12. Reject despatch packaging, strapping, covers etc.
	13. Staff food and food packaging waste.
	14. Office waste.
	15. Lawn clippings.
6. Biodiversity depletion	1. Spread of exotic organisms. (see "Spread of weeds" etc)
	2. Loss of riparian vegetation (from waterways adjacent to or running
	through property) or wildlife corridors from clearing.
	3. Sourcing stock removed from National Parks, reserves & sensitive
	areas.
	4. Clearing remnant vegetation and species habitat.
	5. Inappropriate (or illegal) control of protected native bird & animal
	species for crop protection.
	6. Native animals and birds eating rat/mouse poison baits.
	7. Secondary poisoning of owls and other birds/animals feeding on
	poisoned rats and mice.
7. Off-site water pollution from: Sediment (can also contribute	1. Bare soil in in-ground growing areas including inter-row areas.
nutrients to waterways)	2. Unsealed or unstabilised traffic ways.
	3. Rain after cultivation to prepare sites for in-ground planting.
	4. Soil erosion from potted and in-ground production areas:
	5. Irrigation blowouts & leaks.
	6. Glasshouse runoff.
	7. Bare soil drains and drainage areas.
	8. Pump placement on stream bank.
	9. Root trimming & water jetting of in-ground stock.
	10. Soil disturbance from site maintenance, trench digging, construction
	etc.
	11. Bare soil in potted production areas.

	Environmental Issues	Potential Causes
8.	Chemical contamination (other than pesticides)	1. Leaks and spills from stored surface disinfectants and used containers.
		(eg: cleaning chemicals, chlorine etc.)
		2. Oil, grease, fuel leaks and spills from: media steriliser, potting
		machinery, pumps, vehicles.
		3. Replacement & maintenance of old growing structures - toxic
		materials into environment. (asbestos, tar sheeting, lead capping).
9.	Reduced soil health	1. Contaminating soil with pesticides eg. Copper etc.
		2. Poor fertiliser selection for in-ground stock affecting acidification.
		salinisation, biodiversity.
		3. Soil fumigation affecting soil biodiversity.
		4. Excessive cultivation with in-ground stock.
		5. Soil compaction from vehicles in in-ground production.
10.	Air pollution	1. Burning used containers & packaging (especially plastic), & vegetation
	-	waste.
		2. Machinery and equipment emissions. (fumes)
		3. Dust from vehicle traffic on unsealed or unstabilised traffic ways.
		4. Wind-blown dust from stored compost, growing media
		5. Dust from in-ground plant harvesting.
		6. Dust from mixing and turning composted growing media piles
		7. Dust from cultivation of in-ground production areas.
11.	Visual pollution	1. Waste storage areas.
		2. Unsightly/poor maintenance of growing structures and areas.
		3. Unsightly office buildings and surrounds.
		4. Container storage areas.
		5. Night lighting in growing houses.

	Environmental Issues		Potential Causes
12.	Noise pollution	1.	Mowers.
		2.	Phones/PA systems/Sirens etc.
		3.	Vehicle and machinery operation.
		4.	Vehicles & forklifts/tractors.
		5.	pumps.
		6.	heaters & air-conditioners/vents.
		7.	Spray units.
		8.	Potting, planting equipment.
		9.	In-ground production machinery & equipment.
		10.	Sprinklers.
		11.	Steriliser units.
13.	Energy use	1.	Inefficient operation of plat and equipment.
		2.	Inappropriate vehicle and equipment selection.
14.	Off-site terrestrial pollution from:	1.	Wind borne perlite, polystyrene, growing media particles etc.
		2.	Pots, plastic, labels etc.

Environmental issues and their causes rated from most to least significant – Growing Media Production

Environmental Issues		Potential Causes	
1.	Spread of environmental pest species (weeds, exotic insects,	1. Sourcing raw materials contaminated with environmental pest weed	
animals, amphibians, snails etc)		species	
		2. Exotic pest organisms (other than weeds) harbouring on-site and being	
		distributed with despatched loads.	
		3. Environmental weeds/weeds growing on site – seeds infesting aging δ	
		compost heaps.	
		4. Sourcing raw materials contaminated with environmental pest species	
		(other than weeds).	
2.	Pollution of ground water	1. Leaching of nutrients from aging heaps, mixed batches and compost	
		heaps.	
		2. Leaching of tannins from aging heaps.	
		3. Leaching of heavy metals from biosolids.	
3.	Pollution of waterways from nutrients, organic matter and sediment	1. Nutrient loss in water runoff from mixing batches and compost heaps.	
		2. Fertiliser and additive spills in handling and storage.	
		3. Surface water runoff from raw material aging heaps.	
		4. Sourcing sand from stream beds (streambed disruption leads to	
		sedimentation) – self or from contracted suppliers.	
		5. Leftover/spilled growing media losses from property (spilled during	
		loading and despatch).	
4.	Pollution of waterways and soil from chemicals	1. Spills of fuel, oil and grease during storage and filling.	
		2. Runoff of tannins from aging heaps.	
		3. Spills of stored chlorine and other chemical containers.	
5.	Odour	1. Odour from organic waste i.e. fowl manure, biosolids etc.	
		2. Odour from holding dam water and wetting down aging heaps.	
		3. Odour from composting heaps.	
		4. Odour from stored bark aging heaps.	
6.	Loss of biodiversity	1. Sourcing bark from old-growth native forests.	
		2. Clearing remnant and riparian vegetation from the property.	

Environmental issues and their causes rated from most to least significant – Growing Media Production

	Environmental Issues	Potential Causes
7.	Waste, contribution to landfill	1. Vehicle waste - oil, batteries, tyres, used mechanical parts.
		2. Used containers & packaging – fuel, oil, grease, chorine, compost
		additives, fertilisers, office waste, etc.
8.	Noise pollution	1. Raw material delivery and growing media despatch vehicles.
		2. Loading, grading, mixing & composting vehicles & machinery.
9.	Air pollution	1. Dust from unloading of raw bark and other raw materials.
		2. Dust from moving, grading and mixing raw materials, composting
		growing media heaps and stored growing media.
		3. Dust from vehicle traffic on unsealed roadways.
		4. Dust from raw material aging heaps & composting or composted
		growing media heaps.
		5. Dust from loading composted growing media for despatch.
10.	Visual pollution	1. Waste storage areas.
		2. Aging & compost heaps.

Environmental issues and their causes rated from most to least significant - Retail Garden Centres.

Environmental Issues Potential Causes Spread of exotic pest weeds, insects, diseases, animals, Contaminated source (stock, pots, media). 1. 1. amphibians, slugs, snails, etc. Stocking and selling plant species regulated as environmental weeds. 2. Pest organisms harboured in display ponds/gardens. 3. Pollution of waterways with nutrients and organic matter Nutrients leached from plant pots during watering. 2. 1. Waste media from plant spills at receival and during movement of 2 stock, entering drains & waterways. Nutrient loss from fertilised gardens & lawns. 3. Spills of top-dressed fertiliser from fallen pot plants, washed into 4. drains. Spills and leaks from stored fertiliser containers. 5. Soil erosion from delivery and customer vehicles. 6. Sourcing stock taken from National Parks and reserves, especially rare Loss of biodiversity 3. 1. & endangered species. Clearing remnant or riparian native vegetation from property. 2. Depletion of water resource Excess water use from inefficient irrigation. 4. 1. Washing down paths etc. 2. 5. Air pollution Movement/loading of landscape bulk material 1. Emissions from delivery trucks, business vehicles, customer's vehicles. 2. 3. Dust from vehicle and equipment movement. 4. Dust from customer's car park due to vehicle movement. Waste generation General community waste from packaging and containers given to 6. 1. customers. (eg: plastic bags, pots, trays). Waste from packaging. 2. Restaurant waste (food, packaging, oil etc.) 3. Waste from deteriorated and refurbished display & support materials. 4. Office waste, staff food and staff food packaging waste. 5. 6 Waste from prunings, plant throw outs.

Seven responses.

Environmental issues and their causes rated from most to least significant - Retail Garden Centres.

	Environmental Issues	Potential Causes
7.	Pesticides into waterways	1. Pesticides leached from plant pots watered on arrival from supplier,
		and during irrigation/rain. (Eg: weedicide pellets)
		2. Inappropriate disposal of unused pesticide spray and washings from
		spray unit after use.
		3. Leaks of pesticide residues in used, stored pesticide containers.
		4. Spills and leaks from stored pesticides.
		5. Rodent poison baits washed into drains
8.	Noise pollution	1. Sprinkler operations
		2. Delivery, customer and business vehicles, forklifts, pumps & garden
		maintenance equipment operating near neighbours outside normal
		business hours.
9.	Visual pollution	1. Unsightly structures, equipment, vehicles, waste and equipment
		storage areas in view of customers and neighbours.
		2. Lights from customer cars affecting neighbours during night trading.
10.	Unacceptable or illegal spread of Genetically Modified (GM)	1. Sourcing and selling GM stock that is illegal.
plants		

Seven responses.

Appendix 4

Environmental Best Management Practice Chapter

- **Production Nurseries**
- Growing Media Suppliers

Guidelines for Managing the Environment

An Environmental Management System for the Australian nursery industry

Production Nurseries & Growing Media Suppliers

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1 Environmental Management Systems

1.1 What is an EMS?

An environmental management system (EMS) is a process that can improve the overall management of a business and help minimise risks to the environment through a series of steps using continuous improvement. There are several levels of environmental management that can be implemented, depending on a businesses individual circumstance:

A number of recognised EMS's exist that provide guidelines for businesses to follow and can provide recognition of their environmental management credentials if needed.

For further information go to <u>www.horticulturefortomorrow.com.au</u> and download the document "An introductory guide to environmental management in horticulture".

1.2 The NIASA environmental guidelines

This NIASA environmental chapter provides a guide to addressing key environmental issues facing the nursery industry. It is an aid to nurseries and growing media suppliers wanting to manage their environmental impacts. The chapter can also be used as the mechanism for assessment to gain and maintain NIASA EMS accreditation.

2 Environmental legislation and regulations

A core business requirement is to conform to government regulations concerning the environment. There are a large number of Federal and State Acts covering most aspects of the environment. Some Acts such as the Federal Environmental Protection & Biodiversity Conservation Act 1999, and State/Territory Acts addressing environmental protection place a general environmental duty of care on all members of the community. Local authorities regulate many of the State/Territory Acts, but State Environmental Protection Agencies can be active in pursuing environmental pollution issues, and State Natural Resource Departments regulate resource issues such as vegetation management, soil and salinity issues and water allocations.

Because local authorities are responsible for many of the "on-the-ground" interpretations of environmental legislation, businesses are advised to maintain regular liaison with local authorities concerning development and environmental issues. Some issues are worked out in partnership between local authorities and the nursery industry organisations around Australia. State/Territory Nursery and Garden Centre Industry Development Officers are points of contact for these issues.

For a detailed discussion of legislative requirements affecting the nursery industry, refer to the Nursery & Garden Industry Australia's report available from Horticulture Australia Ltd "Environmental Legislation Investigation (2003)". This publication explains the range of Commonwealth and State/Territory legislation and how it may impact on nurseries. It arranges environmental legislation in the categories of planning, water supply, pesticide use, pollution and discharges, waste management, biodiversity and nursery management.

3 Environmental Practices

This section addresses potential environmental impacts that could result from nursery production and ways they can be managed to minimise impacts or enhance the environment.

3.1 Managing water

3.1.1 Water quality and off-site impacts

Recent concern about algal blooms, increasing nutrient loads, pollution and reduced flow rates in our rivers, wetlands and coastal waters has focussed attention on the impact of horticulture on these systems. The nursery industry has also come under close scrutiny about nutrients, chemicals, sediment and litter in wastewater discharged from nurseries into stormwater outlets. Wastewater, or runoff water, consists of the water that drains from all parts of the nursery after rain or irrigation. The close proximity of most nurseries to populated areas and sensitive water catchments sharpens community concern about nursery wastewater.

Much of the wastewater from nursery production areas contains dissolved nutrients from applied fertilisers. Nutrients moving into off-site waterways and wetlands change the balance of nutrients in the water and contributes to algal blooms, wetland deterioration, marine ecosystem deterioration, and anaerobic conditions leading to death of freshwater and marine species. In some situations. excess nutrients in water can also contribute to salinity in soil and ground water. Production nursery runoff is increasingly being viewed as a pollutant under State/Territory environmental protection laws, and must conform to State-based critical release values.

Chemicals, particularly pesticides, can remain active at low concentrations in the environment, posing a direct health hazard to mammals, birds and aquatic life, or indirect effects on their habitats and food sources. Some pesticide residues can be leached into groundwater where contamination can be persistent. Pesticide pollution exposes operators to prosecution under State/Territory laws governing environmental protection. Practices to minimise chemical pollution of water are discussed in Section 3.2 'Managing pesticides and chemicals'.

Sediment in wastewater can cause problems in natural freshwater and marine ecosystems and contributes much of the phosphorus (attached to soil colloids) that pollutes waterways.

The main types of litter in nursery wastewater are likely to be potting media components, and plastic waste. Litter mainly causes visual pollution in waterways but in some instances may affect wildlife.

Wastewater management decision diagram



Suggested Practices

A number of practices can be implemented or improved to reduce the amount of wastewater generated and to reduce pollutants in wastewater. However due to the nature of nursery production they will not be completely effective. Therefore a highly desirable practice is to collect and recycle or reuse wastewater from the production area to prevent wastewater leaving the property. If a recycling/reuse system is not in place it is important to ensure any wastewater running off the property has been collected and treated to remove pollutants before releasing into off-site drains or waterways.

Collecting and recycling or reusing wastewater

Collecting all nursery wastewater from production areas is the single most significant action to prevent release of polluted wastewater into the environment. Recycling it as irrigation water for nursery stock or reusing it in non-production areas such as lawns, gardens and windbreaks saves on water and fertiliser use, so reducing costs.

Collecting all nursery wastewater from production areas is the single most significant action to prevent release of polluted wastewater into the environment...

An effective recycling/reuse system involves the following:

- Intercept and divert water from outside your property away from your nursery. This reduces the volume of water to be stored, and prevents pollutants & diseases being carried through your nursery.
- Seal growing areas to minimise infiltration of wastewater into the soil and to direct wastewater to drains. Commonly 200µm thick plastic is laid with at least 75mm depth of 10-25 mm diameter gravel on top. Other options are concrete or bitumen (see NIASA Best Management Practice Guidelines section 1.1.16). Level the growing beds to a minimum grade of 1:70 to ensure movement of wastewater to drains.
- Plan layout for drainage and prepare drains to collect wastewater and deliver to a collection dam or tank. Follow local authority guidelines for designing drainage and storage capacity.
- Set up filters and treatment systems to remove sediment, litter and undesirable chemicals from wastewater.
- Collect wastewater into storage dams/tanks. Storage dams/tanks need to be specially constructed for holding wastewater. Natural wetlands on your property should not be considered as storage for wastewater due to potential pollutants in wastewater affecting the wetland. Follow local authority guidelines for storage capacity and construction.
- Disinfest wastewater to remove pathogens before recycling or reusing. (see NIASA Best Management Practice Guidelines section 1.1.1).
- Regularly monitor wastewater to determine effectiveness of treatments. Monitor pH, nutrient levels (particularly nitrates), electrical conductivity (EC) which is a measure of

total salts in the water, and biological oxygen demand (BOD). Keep a record of wastewater monitoring results (see Wastewater Quality Record in Appendix 3 "Sample documents").

References about recycling or reusing wastewater:

- Designing a nursery reed bed. The Nursery Papers 2003:7
- Managing wastewater with a wetland. J Badgery-Parker, (2003) NSW Agriculture.
- Managing water in plant nurseries a guide to irrigation, drainage, and water recycling in containerised plant nurseries. NSW Agriculture, 2nd edition, 2000.
- Monitoring and managing recycled water quality in nurseries. The Nursery Papers, 1996:4.
- NIASA Best Management Practice Guidelines Chapter "Nursery industry water management best practice guidelines".
- Reed beds clean up nursery run-off water. The Nursery Papers 2003:5

Treating wastewater before releasing it off-site

Businesses that do not currently recycle or re-use water must ensure water leaving their property is within local authority guidelines.

Options for achieving this may include:

- Set up sieves, baffles or grates to collect floating litter,
- Use sedimentation basins, hay bales, filter fences, or sediment traps to remove suspended soil before release to drains or waterways,
- Aerate and mix water in holding dams to encourage biological breakdown of pollutants and nutrients & prevent algae growth,
- Treat wastewater in holding dams to remove chemicals, nutrients and other pollutants to an acceptable level.
- Direct collected runoff water through vegetated drainage areas and/or well-constructed wetlands to remove sediment and nutrients.
- Regularly monitor wastewater before release to ensure it meets local authority guidelines; in particular, pH, nitrates, phosphate, and BOD. Keep a record of wastewater monitoring results (see Appendix 3 "Sample documents").
- Check with your local authority to determine their regulations and critical release values concerning wastewater.
- Retain riparian vegetation (trees, shrubs and grass on banks and verges of waterways) if waterways bound or run through the property. Riparian vegetation filters sediment and nutrients from water running into the waterway, and stabilises waterway banks.

Practices to reduce nutrients in wastewater

Some simple changes to existing production nursery systems can greatly reduce fertiliser losses. The following information provides options for reducing nutrients in wastewater.

Reduce fertiliser applied to potted or in-ground plants

• Use the minimum rate of fertiliser to achieve desired growth rate and quality. The most efficient fertiliser rate will vary according to species, irrigation method, media type, fertiliser type and application method, and growing conditions. Each nursery needs to develop its own efficient fertiliser management program.

Deliver fertiliser and water to pots in a way that minimises losses and wastage

The nutrients in wastewater results mainly from fertilisers leaching out of pots during irrigation or rain, and from fertiliser that falls onto the ground between pots either in solid form or as soluble fertiliser in irrigation water.

The most critical time for these losses are at or soon after potting up, and when pots are topdressed, sprayed or drenched with fertiliser. When deciding on the best strategies to reduce nutrient losses, the following issues need to be considered:

Fertiliser forms – Controlled release fertilisers (CRF's) are less prone to leaching than granular soluble or liquid fertilisers, but leaching can still remove significant amounts of CRF nutrients during the life of the crop (Cresswell and Huett 1996).

Fertiliser application - If possible, incorporate CRF's into the growing media at or just before potting up. Minimise top-dressing during the growing cycle to reduce spillage onto the ground when pots are watered, handled or knocked over. Pot supports are an option to prevent top-dressed potted plants falling over. When top-dressing fertiliser, do not spread over the general area of potted plants, rather deliver quantities directly to each pot. Soluble or liquid fertilisers are best applied through drip irrigation or bottom watering systems. Don't liquid feed plants just before irrigation or if rain is expected as most of the nutrients will be leached out of the pots.

Irrigation type – Irrigation system design is a fundamental tool in minimising nutrient losses and improving crop growth. Applying soluble or liquid fertilisers through overhead fixed irrigation systems can be wasteful of fertiliser as much of the fertiliser (and water) falls outside the pots. If fertigation through fixed overhead sprinklers is unavoidable, then wastewater collection and treatment or recycling/re-use is critical to avoid nutrient losses to the environment. Losses can also be reduced by optimising the number of pots within the sprinkler area (that is, minimise inter-pot area where fertiliser and water is wasted without sacrificing good plant spacing for effective crop growth). Sub-irrigation or other non-runoff irrigation techniques are the ultimate systems to prevent environmental damage from nutrient runoff.

Irrigation method – Aim to reduce the volume of irrigation water to minimise leaching to about 12%. With intermittent top irrigation some leaching is needed to remove salts and stop the plants being injured by excess salts in the pot (Cresswell and Huett 1996). Reduce irrigation intensity and duration, and increase frequency (pulse watering) to optimise rewetting of growing media and minimise runoff. Pulse watering is particularly effective when using drip irrigation.

Improve retention of fertiliser in pots to achieve desired growth rate and quality

- Use growing media with a high cation exchange capacity (holds nutrients more firmly).
- Use growing media with good water retention properties.
- Use wetting agents with growing media that are difficult to wet.

Potting up areas, growing media storage areas and fertiliser storage

- Clean up spilled media and fertiliser in potting up areas regularly. Do not wash into drains during cleanup. Ensure potting up areas and areas for storing growing media are covered to protect from rain. The areas may need to be bunded to prevent runoff water moving through the area during heavy rain.
- Store fertilisers in a weatherproof area and in a way that prevents spills and leaks from bags and containers.
- Take care when handling fertilisers to prevent spillages. If fertiliser is spilled, have an emergency response plan for cleaning up the spill and ensure all staff are aware of it and will act on it.

Practices to reduce sediment in wastewater

Sediment in wastewater or runoff is the result of soil erosion caused by rain splash on bare ground and fast water flow through areas susceptible to soil loss. Where possible avoid steep slopes and soils prone to erosion for nursery production.

A key strategy for preventing soil erosion is to maintain cover over soil. Covers may include vegetation, mulches, concrete, plastic sheeting and so on. Ways to achieve this are:

- Seal potted production areas using plastic with gravel overlay ensuring drainage from these areas can be collected and directed.
- Seal all roadways, carparks and delivery areas with concrete or asphalt, or stabilise with gravel or compacted road base (hardstand).
- Provide bridging or under-road culverts where traffic areas cross drains to prevent vehicles driving through drains and drainage areas.
- Ensure construction sites (such as buildings, infrastructure and dams) retain as much of the natural vegetation as possible and the area is protected and/or vegetated as soon as possible after disturbance. Install sediment traps such as hay bales around disturbed ground or temporarily mulch disturbed areas. Plant grass or other vegetation over disturbed sites for longer term protection.
- Seal drains using concrete, plastic sheeting or use pipes, or construct shallow, broad, grassed drains. Ensure low natural drainage areas are vegetated.

In in-ground production areas, apply the above principles and also:

- Minimise cultivation of in-ground production areas.
- Maintain grassed interrows.
- Minimise soil surface disturbance when planting and harvesting.
- Limit vehicle movement throughout the site.

If there is a continuing risk of soil erosion, then steps need to be taken to remove sediment from runoff water before it leaves your property (for example sediment traps and barriers).

Practices to reduce litter and other floating pollutants in wastewater

Litter in wastewater includes growing media components such as perlite and vermiculite, plastics and other floating rubbish. Practices to reduce floating litter include:

- Seal and cover stored media and waste media sites to prevent media components being washed into nursery drains, or off-site drains and waterways.
- Regularly clean up spilt media from potting up areas, growing on areas and place in allocated waste media area.
- Use bulk waste bin services for secure disposal of waste.
- Train staff to avoid littering and provide litter bins.
- Run wastewater through sieves, baffles or grates to collect floating litter.

References about general water quality management:

- Container media management. DPI&F, Cleveland, Qld 1993
- Managing water in plant nurseries a guide to irrigation, drainage, and water recycling in containerised plant nurseries. NSW Agriculture, 2nd edition, 2000.
- Managing nursery runoff techniques to reduce nutrient leaching from pots. NSW Agriculture, 1996.
- NIASA Best Management Practice Guidelines chapter "Nursery Industry water management best practice guidelines".
- Nutrient charting. The Nursery Papers 2003:3
- Reducing nutrient leaching from pots. The Nursery Papers 1998:9

3.1.2 Water use efficiency

Water is a precious, limiting resource in the dry continent of Australia. Excess water use for human purposes depletes surface and underground supplies and makes our rivers and streams vulnerable to degradation.

Drought and long term trends toward lower rainfall in parts of the country have made all sections of our society realise that more needs to be done to reduce water use. Water is becoming progressively more expensive and harder to access throughout Australia. More water is being returned to river systems to maintain environmental flows. Water providers are moving toward a more structured pricing system to encourage consumers to conserve and value the resource.

Efficient water use also improves crop growth and business turnover by avoiding water logging and nutrient leaching.

Suggested practices

Collect and recycle or reuse wastewater

For nurseries, the most significant water efficiency strategy is to collect and recycle or re-use wastewater from the property. This is also a significant strategy for reducing pollutants leaving your property (See page 4 "Collecting and recycling or reusing wastewater"). Recycling or reusing wastewater makes good sense when water is limited and expensive.

Irrigation system selection and design

Select and use efficient irrigation systems and strategies. The type of irrigation system selected can influence the amount of water used, and the amount of water and nutrients lost to plants.

Bottom-watering systems

The most efficient systems are bottom-watering systems such as ebb-and-flow (flood), flood floors, troughs, capillary matting and sand beds. They can be more expensive to set up than overhead watering systems but apply water more evenly, do not wet the foliage and can result in little or no runoff.

Top-watering systems

These include fixed overhead sprinklers, mobile booms, drip irrigation and hand watering. Of these, drip irrigation potentially is the most efficient, as all the water is applied to pots, overwatering is more easily controlled and less water is needed to wet and re-wet the potting media. Mobile booms can also be efficient if designed correctly.

Fixed overhead sprinklers are the most widely used system and good management is needed to ensure the right amount of water is applied evenly and efficiently over the whole area. To optimise efficiency consider: sprinkler watering pattern and operating pressure, sprinkler layout, application rate and wind protection. Pots normally cover 20-50% of the area under sprinkler irrigation which means much of the applied water is wasted. Poorly designed

overhead sprinklers have uneven distribution that leads to dry areas, which are generally dealt with by watering until the driest pots are wet. This practice requires more water being applied than is needed. Drip irrigation and mobile booms are

Apart from being labour intensive, hand watering can result in uneven application, poor rewetting of growing media and high runoff and leaching of nutrients if not done correctly.

References:

- Managing water in plant nurseries, NSW Agriculture 2000 (Rolfe,C, Yiaoumi, W, & Keskalu, E)
- NIASA best management practice guidelines chapter "Nursery industry water management best practice guidelines".

Selecting an irrigation system for your nursery will depend on many factors that may preclude use of the most efficient system across all parts of your nursery. Your objective should be to upgrade your irrigation system as time and resources allow to improve water use efficiency and reduce environmental impacts.

General water use management

Irrespective of your type of irrigation system there are some management actions that can be taken to improve water use efficiency:

- Know how much water you use. Install a water meter on your irrigation supply and maintain a weekly record of water use (see Irrigation Water Use Record in Appendix 3 "Sample documents"). Without this information, it is difficult to plan and monitor water use.
- Determine your nursery's water needs (This may be limited by availability of water) and develop an irrigation and water use strategy to stay within the plan.
- Group plants with similar water needs and set up efficient irrigation 'blocks' for each group. For example, some groupings with low water needs can be irrigated separately to the rest of the nursery and on a lower water output irrigation type and schedule.
- Maintain your irrigation system so it operates at full efficiency at all times.
- Install Schrader valves (tyre valve fittings) at solenoids to monitor optimum operating pressure of sprinklers.
- Ensure you know and meet all local authority regulations governing design and installation of irrigation systems, and use of water from town supplies, streams and bores.
- •

3.2 Managing pesticide & chemical losses to the environment

Pesticides (including insecticides, miticides, fungicides, herbicides, bactericides, molluscicides and algicides) can damage plant species and kill animal species in natural ecosystems if they enter the water, air or soil off-site. Of particular concern is the effect of pesticide residues on neighbouring or downstream sensitive ecosystems such as wetlands, fresh water and marine habitats, and national parks and reserves. In heavily populated areas great care is needed to prevent pesticide drift onto neighbours.

Chemicals other than pesticides are widely used for cleaning and sanitising around the nursery, and for treating recycled water. Care needs to be taken to ensure these chemicals do not enter waterways and off-site drains.

Suggested practices

Avoid pesticide drift

- Select the right combination of spray unit, nozzle type and size, and pressure.
- Avoid spraying when wind speed is variable and less than 3 km/hr or exceeds 15km/hour.
- Avoid spraying when wind direction is toward sensitive natural areas or neighbours.
- Avoid spraying on very hot days.
- Erect or plant barriers to catch possible spray drift.
- Establish buffer zones between production areas and neighbours or sensitive natural areas (such as wetlands, waterways).

References:

• Best Practice Manual for Pesticide Application in the Nursery and Garden Industry CD ROM, Section 3.1 "Managing spray drift", available from NGIA.

Use pesticides & chemicals responsibly

- Always read the label and follow label instructions.
- Keep good records of application, including date and time applied, location of area treated, pest/disease targeted, pesticide used, rate/ha, amount of product per litre of water, application equipment used, weather conditions, operator signature (see Appendix 3 "Sample documents").

A suitable pesticide application recording system is the Pesticide Management Diary CD ROM available from Nursery & Garden Industry Queensland, or your local Nursery Industry Development Officer.

- Ensure one person in the business has completed an accredited chemical user's training course. (for example a ChemCert certificate, refer to the ChemCert Australia website www.chemcert.org.au).
- Ensure all staff who apply pesticides have adequate in-service training.
- Regularly calibrate and maintain pesticide application equipment.
- Only use pesticides registered for use in your State or have an Australian Pesticides and Veterinary Medicines Authority (APVMA) permit for your State.
- Keep an updated list of all pesticides used in your nursery.
- Keep Material Safety Data Sheets for all pesticides used. These provide information about health hazards and safe handling, including transport, storage and spill clean up.

Current pesticide registrations for all States are available from: Australian Pesticides & Veterinary Medicines Authority (APVMA) website (<u>http://www.apvma.gov.au/</u>).

Minimise pesticide applications

Pesticides should be thought of as only one strategy for managing pests, diseases and weeds because of potential impacts on the environment, neighbours, staff and development of resistant pest strains through overuse. By minimising pesticide use, you encourage beneficial insects and micro-organisms to flourish.

Non-pesticide strategies plus strategic pesticide use form the parts of an Integrated Pest Management (IPM) strategy. These parts include:

- Train yourself and your staff to recognise all the pests and diseases that can attack your particular crops, their symptoms of attack and life cycles.
- Monitor crops for pests, diseases and weeds on a regular schedule and record results. Use monitoring to guide pesticide treatment and to check effectiveness of management measures.
- Use environmentally friendly pesticides where appropriate, such as oils, soaps and Bacillus formulations.
- Use pheromone traps and bug zappers for moths where applicable.
- If a pesticide is needed:
 - Use narrow-spectrum pesticides instead of broad-spectrum pesticides.
 - Use spot applications of pesticide rather than blanket sprays if monitoring indicates an infestation is localised.
 - Use pesticides strategically when the pest or disease is most vulnerable.
- Practice good hygiene to limit disease in particular refer to NIASA Best Management Practice Guidelines (published by NGIA).
- Screen ventilation areas to keep out thrips, whitefly and aphids.
- Use resistance minimisation strategies such as pesticide rotation based on mode of action groups..
- Use biological control agents (BCA) where available and appropriate. Use of BCA's requires all of the above to be in place and to maintain a good environment to encourage their survival and growth.

• Have an all-year-round weed management program in place, in and around the growing area, as weeds can harbour pests and diseases and act as a constant source of reinfestation.

References about Integrated Pest Management:

- Goodwin, S et al (2002) Integrated Pest Management in Ornamentals: Information guide, NSW Agriculture, Orange, NSW. (Also available through NGIA).
- A step-wise programme for practicing IPM. The Nursery papers 1997:5
- The Good Bug Book (2003) Australian biological Control Inc PO box 436, Bourke St, Richmond NSW 2753.
- Pest & Disease prevention is better than cure. The Nursery Papers:2004:3
- Best practice manual for pesticide application in the nursery and garden industry CD ROM (available from NGIA)

Protect water supplies from pesticide and chemical contamination

- If pesticides are applied in irrigation water, comply with State regulations restricting backflow or back-siphoning. Backflow can be restricted by installing an anti-backflow device or pumping water into a separate tank, then pumping and injecting pesticide into the irrigation line from this tank.
- Do not connect your irrigation system directly to a public water supply.
- Do not inject a chemical on the suction side of the irrigation pump.
- Keep the end of a fill hose above the water level when filling a spray tank. This avoids back-syphoning into the water supply and contamination of the hose with pesticide.
- Fill spray tanks with water and then move them away from any surface water storages before adding chemicals.

Minimise movement of pesticides into wastewater runoff

- Avoid application of pesticides immediately before rain or irrigation. However some herbicides need water for incorporation into growing media or soil.
- If using granular herbicides in pots, restrict water leaching from pots. Most herbicide is lost into wastewater in the early part of the first irrigation (or rainfall) after application. Gravel under pots retains and retards movement of leached herbicides to some extent (Whitwell et al 1995).
- Apply herbicides to small areas at any one time; avoid blanket application to the whole nursery in a single application. Ensure herbicides are applied into pots where the herbicide is bound to potting media, not between pots where it can be picked up by runoff water.
- Use granular pre-emergent herbicides in preference to sprayed herbicide.
- Do not apply herbicide to pots just before sale. This transfers the problem of herbicide leaching and runoff to the retail nursery or customer who may not have wastewater remediation or collection facilities, so the herbicides have a high potential of entering public drains and waterways.

Safely store pesticides and chemicals

- Store pesticides and chemicals in a lockable, weatherproof, fireproof, well-ventilated area away from production facilities, waterways, water storages, and flood-prone areas.
- The floor should be impermeable, and the store area able to contain spilt liquid and be easily cleaned. Spilt liquid can be contained by bunding (an embankment or wall) or other construction to prevent spills leaving the area.
- Store pesticides and chemicals in their original container. Ensure the container is clearly labelled.
- Store pesticides separate from fertilisers and chlorine or other oxidising agents.
- Store liquid pesticides and chemicals below powder pesticides if on shelving.
- Maintain an up-to-date inventory of stored pesticides (see Appendix 3 "Sample documents")
- Only store sufficient pesticide on site to meet needs.
- Regularly check pesticide and chemical containers for any leakage or damage.
- Maintain a chemical cleanup kit near the area (see page 15 "Clean up spills").

All States have regulations concerning storage of pesticides on farm and business sites. Check with your local authority to ensure you conform to these regulations.

References:

- The storage of nursery chemicals, Section 2.4 in Best Practice Manual for Pesticide Application in the Nursery and Garden Industry CD ROM, available from NGIA.
- Handling & storage tips, in 'About ChemClear', in the Chemclear® website: <u>www.chemclear.com.au</u>

Pesticide mixing, filling and washing down areas

- Site the mixing and wash down area away from water sources, drains and streams.
- The area should have a bunded concrete pad that will collect spills and wash down rinsings and drain them to a containment tank/sump to allow breakdown of pesticides.
- Never leave a spray unit unattended while it is being filled.

Dealing with leftover spray and washings from a spray unit

- Prevent leftover pesticide by carefully calculating how much is needed for the area to be sprayed.
- Do not allow leftover spray or rinsings from a spray tank or from empty pesticide or chemical containers to enter streams or drainage from the property. Spray leftover pesticide and washings from rinsing after spraying onto a mulched or vegetative area away from people and animal access areas and away from drains, low drainage areas, waterways and water storages (follow label guidelines), or spray onto another area of production plants for which the pesticide is registered.

Clean up spills

- Have an emergency spill plan in place, train staff how to deal with spills and have spill kits located conveniently to the storage and mixing areas. Spill kits should be located outside the chemical storage area and include:
 - o A shovel
 - Absorbent material, such as kitty litter, vermiculite, earth or dry sand;
 - Soda-ash (up to 10%) or hydrated lime can be added for organochlorine spills;
 - Containers to hold the absorbent material or other leaking containers;
 - Protective clothing, including gloves, respirator, boots and eye protection.

Avoid using sawdust or other combustible materials as absorbents in spill kits.

- Control the spill quickly. Do whatever you can to stop the leak or spill. But put on protective equipment first !
- Contain the spread. For example use a shovel to form an earth wall or barrier, and use the absorbent spill-kit material to soak up or wipe up the spill. The important thing is to prevent the spilled material from getting into any body of water or into drains.
- Properly dispose of the chemical-drenched absorbent clean-up material.
- Use hydrated lime or bleach to decontaminate spill surfaces. But never use these two materials together.
- Report the spill to authorities if it is large or if it enters waterways.

References

- Section 1.4 "Emergency procedures" in Best practice manual for pesticide application in the nursery and garden industry CD ROM (available from NGIA).
- Handling & storage tips, in 'About ChemClear', on the Chemclear® website: <u>www.chemclear.com.au</u>

Dispose of waste pesticide containers safely

Businesses under various State regulations are required to dispose of empty chemical containers safely. When purchasing, ask if used pesticide containers can be reused, returned, refilled or recycled.

- Used containers must be triple rinsed or pressure rinsed immediately after emptying the container. Residues are more difficult to remove when they are dry. Dispose of rinsate into spray unit.
- Puncture steel containers so that they cannot be re-used. Pass a steel rod or crowbar through the neck/pouring opening and out the base of the container.
- Do not puncture plastic containers included in reconditioning/reuse programs.
- Store rinsed containers in a secure storage area on-site until delivery to an approved waste depot, recycling or collection site.

References:

- Disposal, in Section 2.6 Best practice manual for pesticide application in the nursery and garden industry CD ROM (available from NGIA)
- Agsafe standard for effective rinsing of farm chemical containers (on the Drummuster website. <u>www.drummuster.com.au</u> and enter the 'cleanliness standards' section).

Dispose of old, de-registered or unwanted pesticide concentrates safely

- These need to be disposed of so they do not pose a risk to the environment, or to human health.
- Mark the containers so they are identified for disposal. This may need to be a paint mark or other permanent mark on old, rusting containers. Ensure the containers cannot leak and store in a separate part of your chemical storage facility until they can be removed for disposal. Ensure the pesticide is known by maintaining the product label ion the container.
- Use government collection programs to dispose of these pesticides. Details of these programs are available on the ChemClear® website: www.chemclear.com.au or phone (02) 6230 4799. The ChemClear® program started in 2004 and replaced the old ChemCollect® program.
- If a government collection program is not available, then use a certified or approved chemical waste contractor or supply company.
- If transporting these pesticides to a collection centre, place them on the back of a utility or truck It is illegal to transport pesticides in the boot or cabin of a vehicle, or back of a station wagon, where fumes may affect the driver or passengers. Ensure containers cannot leak during transport.

Prevent oil, fuel, and grease pollution

- Regularly maintain on-site vehicles and equipment to prevent oil and grease leaks, and burst hydraulic hoses.
- Construct a bund (liquid-proof wall) around fuel, oil and grease storage areas sufficient to contain leaks and spills.
- Locate fuel, oil and grease storage areas away from wastewater drains and drainage areas, waterways, water storages and flood-prone areas.
- Have an emergency cleanup strategy in the event of fuel, oil or grease spills.
- Regularly clean up vehicle oil spills and leaks on carpark areas.
Use rat and mouse baits responsibly

If rat and mouse baits are used around the nursery, ensure they are enclosed in bait stations to prevent native birds and animals eating them. Follow label instructions. Native birds may feed on rodents poisoned by baits and suffer secondary poisoning. Some baits have been developed that do not cause secondary poisoning. These are generically called first generation rodenticides and include coumatetralyl, and warfarin (active ingredients).

3.3 Managing air, noise, and odour pollution

These environmental issues are mainly a localised problem to neighbours so being sensitive to your impacts on them will greatly reduce any potential problems. Sometimes it can be difficult to agree with neighbours on what level is tolerable. There are a number of government laws and regulations concerning noise, odour and air pollution.

Assess the risk of potential impacts

The risk of causing discomfort to neighbours from dust, smoke, fumes, noise and odours generated by your business will depend on the number, proximity and type of neighbours. For example if your business is surrounded by suburban homes the risk is greater than if you nearest neighbour is several kilometres away.

You need to assess the potential risk of neighbour complaints and develop preventative strategies based on your assessment.

Suggested practices

Dealing with neighbour complaints

Identify neighbours and neighbouring areas that could be affected by air, noise and odour pollution and be conscious of potential impacts from your business on them.

Take all complaints from neighbours seriously. Maintain a record of complaints and their resolution if you have assessed a high likelihood of potential problems. If complaints persist it may be wise to install monitoring equipment and record monitoring results (see Appendix 3 "Sample documents"). Monitoring equipment should be positioned on your property boundary between you and your neighbour(s).

Air pollution

Air pollution is usually derived from dust, smoke, vehicle and equipment fumes.

Avoiding dust

- Seal traffic ways or stabilise them with compacted road base.
- If unsealed, water down traffic ways regularly. (Note: do not use waste oil to reduce dust from roadways. Oil can enter waterways causing environmental pollution).
- Sprinkle raw material, aging, compost and growing media heaps with water before disturbing them.
- Maintain a suitable barrier of trees between growing media production areas and neighbours.
- Maintain soil cover as much as possible, especially in dry windy weather
- In in-ground production areas avoid working soil to a fine tilth in dry windy weather.

Avoiding smoke

- Do not burn waste, especially rubber, plastic or green waste that generates a lot of smoke. Recycle rather than burn plastic and rubber where possible. Compost organic waste rather than burn it.
- If burning in the open is the only practicable method of disposal of materials, take the following precautions to minimise smoke:
 - Only burn when wind direction is away from neighbours.
 - Do not burn green vegetation.
 - Keep fires small and continually add combustible material. Do not pile material high on fires.
 - Agitate the base of the fire to improve air supply.
 - Avoid adding incombustible materials to fires.

Avoiding fumes

- Maintain a buffer zone and barriers between storage and mixing areas of pesticides, and neighbours.
- Maintain vehicles and equipment to minimise fumes.
- Ensure all vehicles have suitable emission controls in place.

Noise pollution

Potential sources of noise could include vehicles, forklifts/tractors, potting or planting equipment, steriliser units, pumps, heaters & air-conditioners, air vents, spray units, mowers, in-ground production machinery & equipment, sprinklers, phones, public address systems and sirens.

- Use buffer zones to reduce noise to neighbours (noise reduces substantially with distance from the source).
- Use enclosures or barriers to reduce noise. Vegetation, structures of wood, metal or concrete, or earth mounds can effectively reduce noise. The more dense a material the better it will reduce noise.
- Noisy, continuously operated machinery may need special soundproofing.
- Regularly service vehicles and equipment.
- Ensure all vehicles and equipment are equipped with effective muffling devices where possible.
- Only operate noisy vehicles and equipment during daylight hours or during least sensitive times, or reduce length of time of operation or number of times operated to acceptable levels.
- Consider changing from diesel to electric pumps if they are located close to residential areas.

Odour pollution

Odour is most likely to result from media production areas (stored bark aging heaps, composting heaps), plant and media waste storage areas, wastewater storage dams, and use of animal/organic manures for fertilising in-ground production sites or garden areas.

- Avoid the use of raw organic manures or other smelly materials on-site if possible.
- Site odour-generating areas away from neighbours. Visual screening of an odourproducing area reduces the perception of odour problems with neighbours.
- Use buffer zones and/or barriers to reduce odours to neighbours.
- Manage water collection and recycle storages so they don't become anaerobic (anaerobic water may produce hydrogen sulphide and other smelly gases) Aerate and circulate water to ensure aerobic biological activity.

3.4 Managing waste

This section covers hard waste that is created as a part of nursery operations.

Waste is an increasing environmental issue. Sending waste to landfill affects the whole community because landfill is not a good use of valuable space and can result in other environmental impacts such as creation of greenhouse gases and groundwater pollution. Every business should aim to reduce the amount of waste entering landfill. If disposing of waste on-site, ensure it doesn't cause additional pollution problems. For example burning plastics or green vegetation causes air pollution, or dumping waste in or near waterways and drainage areas affects water quality and ecosystems downstream.

Types of waste materials

Examples of nursery waste items include:

- Oil, grease, batteries, tyres and machinery parts
- Used propagation containers and pots
- Used packaging, strapping and labels
- Used plastics such as irrigation lines and plastic mulch
- Used pesticide and chemical containers (disposal of used pesticide and chemical containers is discussed in Section 3.2 "Managing pesticide and chemical losses to the environment").
- Waste from refurbished growing areas and growing/shade houses
- Foliage from pruning and detailing
- Waste growing media from potting area cleanup and reject plants
- Office and staff waste.

Suggested practices

The options for managing waste are to reduce, reuse, recycle and donate waste. The first step is to identify all types of waste in your business, then develop a waste management plan for these items, using the four strategies where appropriate to minimise the amount of waste going to landfill. (see Waste Management Plan in Appendix 3 "sample documents").

Reduce waste

Look for opportunities to minimise the creation of waste.

- Wherever possible choose methods and equipment that give extended life and produce relatively low amounts of waste for disposal.
- Substitute biodegradable materials for those that are not.

Reuse or recycle waste

Look for ways to reuse waste items in your business. For example:

- Reuse propagation and growing containers. They will need to be sanitised before reuse (refer to section 1.1.15 of the NIASA Best Management Practice Guidelines).
- Use incoming packages for outgoing shipments.
- Store materials such as timber and steel for reuse in the business.
- Reuse waste growing media on garden beds and landscaping, or disinfect and reuse as potting media.

The local council may have recycling facilities or local businesses may offer a pickup and recycling service (ensure they are licensed recyclers). Recyclable material needs to be stored separately in a designated area on site for ease of collection. Waste companies may leave recycling containers on your site or at central locations free of charge.

Examples of recycling activities may include:

- Use recyclable goods and packaging where practicable.
- Contract a licensed recycle business to collect recyclable waste.
- Compost waste vegetation.

Donate unwanted waste materials

Many products and materials that cannot be effectively reused in the nursery may be valuable to other organisations. Consider donations such as unwanted supplies, office equipment, and excess building materials to schools, non-profit organisations, community groups or other businesses.

Dispose of waste responsibly and safely

- Where possible, use waste collection programs in your area. Such programs may collect batteries, tyres, oil, cardboard and paper.
- Do not accumulate large amounts of waste on-site.
- Use a licensed waste contractor to removing waste from your site.
- Follow local authority regulations for disposing of waste on-site.

Disposing of waste oil:

Check the website <u>www.oilrecycling.gov.au</u> for locations of used oil collection facilities around Australia. Store waste oil in a leakproof container in a bunded area until collection or delivery to a collection point. Waste oil should not be applied to roadways to control dust.

3.5 Managing native vegetation, habitats and wildlife

Australia is home to over one million different types of native plants and animals. Many of these plants and animals are found nowhere else in the world. This variety of all life forms is known as 'biodiversity'. It is a valuable inheritance that must be protected for the future and every landowner has a responsibility to protect this inheritance.

Landowners can have a negative impact on biodiversity by clearing vegetation on their property so removing habitat, breeding sites and food for native animals, polluting their properties and surrounding areas, or spreading exotic plant and animal species that compete out native species or make the environment unsuitable or hazardous for native wildlife.

Landowners can have a positive impact on biodiversity by protecting and enhancing native vegetation, habitats and wildlife on their properties. Nurseries can also have a positive influence on community behaviour to enhance the environment by propagating and providing local native plant species, and promoting their benefits to the environment.

Suggested practices

A good first step is to discover what conservation programs are operating in your area and to join one or more of these programs or groups. Government departments usually have a range of community programs to encourage conservation of native plants and animals. By working with other interested people and groups your efforts will produce better results. Protecting and enhancing biodiversity is best addressed at a regional level rather than an individual property level.

The range of activities that could be undertaken includes:

Protect off-site natural ecosystems

- Be aware of sensitive ecosystems that could be affected by your business activities for example nearby wetlands or national parks or protected areas, downstream waterways, wetlands or marine environments, and take steps to minimise impacts on them.
- Ensure your suppliers of native plant propagation material have government approval if collecting from the wild. Better still; do not accept propagation material or plants collected from the wild.

Protect on-site native vegetation, habitats and wildlife

- Retain and protect remnant native vegetation on your property. If necessary, fence these areas to keep stock and vehicles out.
- Retain native vegetation along banks of waterways (riparian vegetation) on your property or bounding your property.
- If you have significant remnant or riparian vegetation, use a State environmental officer to check out the plants and animals that live in these areas. Take measures to protect native plants and animals, especially if they are rare or endangered.

Enhance on-site native vegetation and habitats

- Replant local native trees, shrubs and grasses along waterway banks if denuded.
- Replant cleared areas that will not be used, or are unsuitable, for nursery production or agriculture. Similarly if you have degraded wetlands on your property, rehabilitate them to their original condition. Fence these areas to keep out exotic predators, stock and vehicles.

Protect the landscape from competition with exotic pest species

- Prevent on-site harbouring and spread of exotic pest organisms on transported plants, pots, trays and packaging. Exotic organisms may include weeds, insects, fungi, amphibians, and animals.
- In country areas, control feral animals such as foxes, wild cats, rabbits and wild pigs on your property.

References:

• Understanding and managing nursery weeds. The Nursery Papers 2003:11.

Environmental weeds

Many of the plants introduced into Australia over the last 200 years for ornamental use have been beneficial and ecologically benign. But a small percentage has run rampant radically altering the ecosystems they have invaded. Examples are water hyacinth (*Eichhornia crassipes*), rubber vine (*Cryptostegia grandiflora*) and lantana (*Lantana spp.*).

Under recent legislation all new plants imported into Australia must be assessed by the Australian Quarantine and Inspection Service (AQIS) for their potential to become weeds. There is still concern that many 'new' weeds will emerge from plants already present in Australian gardens and nurseries.

Predicting potential invasive weed species in the range of ornamental plants in Australia is complex, and made more so by regional differences that may influence 'weediness' of a species. Local authorities and State governments are at various stages of addressing the issue of environmental weeds.

A national industry initiative between the nursery & garden industry, local and State governments and the community is working to highlight the most invasive garden plants still found in the nursery trade, promote alternatives and raise the awareness of the gardening community about environmental weeds.

To date, the project has highlighted 52 species of garden plants to be discouraged from use in Australian gardens, along with 17 species recognised as weeds of national significance that should never be made available for use in gardens. These plant species are listed in the Nursery Paper Issue No 2000:12 "Invasive plants not wanted in public or private gardens

identified". This list is a good starting point to identify problem species, but check with your local authority or State Nursery Industry Development Officer for current regional information.

References about environmental weeds:

- Invasive plants not wanted in public or private gardens identified, The Nursery Papers 2000:12.
- Discovering alternatives to garden escapes, The Nursery Papers 2001:12.
- Preventing the introduction of potential weeds as ornamental plants, The Nursery Papers 1998:10.

3.6 Efficient energy use

Most of our energy (including more than 90% of our electricity) comes from fossil fuels such as oil, coal and gas. These valuable natural resources are limited and must be used carefully. Burning these fossil fuels pollutes the environment and puts greenhouse gas emissions into the atmosphere, contributing to global warming. Saving energy also makes good business sense as energy often represents a significant cost to nurseries, particularly those that pump large quantities of water or heat greenhouses in winter.

Suggested practices

You can help the environment by switching to more environmentally friendly energy sources and reducing energy use by selecting and maintaining vehicles, equipment and lighting for improved energy efficiency.

Most energy companies now offer what is called "green power". This is produced from renewable energy sources such as wind energy, hydro-power and solar energy. This electricity costs slightly more than conventional power from coal-fired power stations. However, costs can be maintained at the same total cost by improving energy use efficiency.

Options for reducing energy use include:

- Arrange an energy audit of your business. Energy audit companies can provide expert advice on how to save electricity. For a list of companies Australia-wide visit the NSW government Sustainable Energy Development Authority website at: http://www.seda.nsw.gov.au/esa/middlesub.asp and look up 'Energy auditors'. Some States have more comprehensive State-specific energy auditor lists as follows: WA: http://www1.energysmartdirectory.com Vic: http://www.seav.vic.gov.au
- Select energy efficient equipment when purchasing irrigation pumps, heaters, airconditioners, potting machines, steam sterilisers and so on.

- Optimising water use will optimise electricity or fuel demand for pumping.
- Where greenhouses are heated or cooled, use multi-span in preference to tunnel greenhouses (heat losses are much less due to less wall area).
- Ensure heated water distribution pipes are well insulated to minimise heat losses
- Use energy efficient lighting. For example, compact fluorescent bulbs have about onequarter lower wattage and eight times the life of standard incandescent bulbs.
- Turn off lighting and equipment when not in use.
- Have a regular maintenance program for all vehicles and equipment, including irrigation equipment & lines.

4 NIASA Accreditation Checklist – Environment (production nurseries)

4 1: Wastewater management

Issue/Activity	Needs	Being	Satisfactory	Complies fully	Doesn't
Off-site drainage water is	attention	upgraucu		Tuny	appiy
deflected from production					
areas					
Westewater drainage					
wastewater dramage					
systems are adequate					
Wastewater is collected					
and collection ponds have					
sufficient capacity to hold					
irrigation and rain runoff					
Wastewater is recycled/					
reused OR					
The business knows local					
authority requirements for					
released wastewater					
quality.					
Wastewater is adequately					
managed or treated to					
meet local authority					
guidelines before release					
off the property					
Wastewater is regularly					
monitored for:					
• PH					
• Conductivity					
• Conductivity					
• Suspended material					
• Nitrates					
 Phosphates 					
• Other quality					
parameters (list):					

4.2: Nutrient management to minimise wastewater pollution

Issue/Activity	Needs attention	Being	Satisfactory	Complies fully	Doesn't
A strategy is in place to match nutrient use to crop needs	uttention	upgruucu		Tuny	appry
A strategy is in place to reduce nutrient leaching from pots					
A strategy is in place to reduce fertilisers falling onto the ground between pots					
Fertilisers are stored in a way that prevents their release to the environment					

4.3 Reducing sediment in wastewater and drainage

4.3.1 Soil cover to control erosion

Issue/Activity	Needs	Being	Satisfactory	Complies	Doesn't
	attention	upgraded		fully	apply
Potted production areas					
are sealed					
Walkways, roads and					
traffic areas are sealed or					
stabilised (with gravel or					
hardstand)					
Drains and drainage areas					
are either sealed or					
grassed					
Soil disturbance is					
minimised around					
construction areas					
Cultivation of in-ground					
production areas is					
minimised and soil cover					
is maintained					

4.3.2 Trapping sediment

Issue/Activity	Needs	Being	Satisfactory	Complies	Doesn't
Sediment traps are installed where					
near soil disturbance or cultivated areas)					

4.4: Irrigation and water efficiency

Issue/Activity	Needs	Being	Satisfactory	Complies	Doesn't
A water mater is installed	attention	upgraueu		Tuny	appiy
A water meter is installed					
and water use measured					
Efficient irrigation					
systems are being used					
The irrigation system is in					
good condition and well					
maintained					
Irrigation is scheduled					
according to plant needs					
Plants are grouped					
according to water needs					
and irrigation is sectioned					
and applied according to					
these needs					

4.5: Managing pesticide and chemical losses to the environment

4.5.1 Pesticide drift

Issue/Activity	Needs attention	Being upgraded	Satisfactory	Complies fully	Doesn't apply
Spraying is done in				•	
suitable weather					
conditions					
Spraying equipment is					
selected and regularly					
calibrated to minimise					
drift					
Buffer zones and barriers					
are established between					
production areas and					
neighbours or sensitive					
environmental areas					
where needed					

4.5.2 Responsible pesticide use

Issue/Activity	Needs	Being	Satisfactory	Complies fully	Doesn't
Records of pesticide use are kept and are adequate (includes weather conditions)	attention	upgradeu		luny	appiy
Copies of pesticide labels and material safety data sheets are kept on-site					
Pesticides are mixed and applied according to label/permit directions					
At least one person in the business has completed an accredited chemical user's course					
Staff applying pesticides or using chemicals have been trained to handle and apply them correctly and safely					
Only registered or approved chemicals are used					

4.5.3 Minimising pesticide use

Issue/Activity	Needs attention	Being upgraded	Satisfactory	Complies fully	Doesn't apply
Crops are regularly					
monitored for pest and					
disease					
Pest control programs					
follow IPM principles					

4.5.4 Preventing pesticides and chemicals entering water supplies

Issue/Activity	Needs attention	Being upgraded	Satisfactory	Complies fully	Doesn't apply
Where pesticides are injected into irrigation water, systems are in place to prevent back- siphoning into water supplies					
Strategies are in place to ensure pesticides and chemicals do not enter off-site waterways and drains.					

4.5.6 Pesticide and chemical storage (see Section 8 of NIASA plant health checklist)

Issue/Activity	Needs	Being	Satisfactory	Complies	Doesn't
	attention	upgraded		fully	apply
The storage area is:					
• Secure and lockable					
• Weatherproof					
• Fireproof					
Constructed to					
contain leaks and spills					
Away from					
waterways and water					
supplies and above					
flood levels					
Powder chemicals are					
stored above liquid					
chemicals					
Pesticides are stored					
separate from fertilisers					
and chlorine					
Pesticides are stored in					
original containers,					
clearly identified and in					
sound condition.					
A pesticide & chemical					
inventory is maintained					
A suitable spill kit is					
maintained near the					
storage area					

4.5.7 Pesticide and chemical disposal

Issue/Activity	Needs attention	Being upgraded	Satisfactory	Complies fully	Doesn't apply
Leftover pesticide in sprayers and prayer washings are disposed of responsibly					
Used pesticide containers are safely stored until disposed of responsibly					
Old or unwanted pesticide concentrates are disposed of responsibly					

4.5.8 Chemical mixing, filling and washdown areas

Issue/Activity	Needs attention	Being upgraded	Satisfactory	Complies fully	Doesn't apply
The areas are sited away					
from water sources,					
waterways and drains					
The areas are designed					
and constructed to contain					
and hold liquids					
Strategies are in place to					
prevent spills and losses					
during mixing, filling and					
washdown					

4.6: Managing air, noise and odour pollution

Issue/Activity	Needs attention	Being upgraded	Satisfactory	Complies fully	Doesn't apply
Risk of air, noise and odour impacts on neighbours has been assessed					
Strategies are in place to reduce air, noise or odour impacts if risk assessment indicates a potential problem					
A record of complaints and their resolution is kept					

4.7: Managing waste

Issue/Activity	Needs attention	Being upgraded	Satisfactory	Complies fully	Doesn't apply
All waste items generated by the nursery have been identified					
A waste management plan has been developed and implemented for all waste in the nursery					
Waste is reduced, reused, recycled or donated where possible					
Non-recyclable waste is collected for disposal by licensed waste contractors					

4.8: Managing native vegetation, wildlife and habitats

Issue/Activity	Needs	Being	Satisfactory	Complies	Doesn't
	attention	upgraded		fully	apply
The nursery has a native					
vegetation and wildlife					
conservation plan for the					
site					
Feral animals are					
controlled on-site					
Environmental weeds are					
controlled on-site					
Garden plant species					
identified as					
environmental weeds are					
not grown and sold					
Strategies are in place to					
prevent spread of exotic					
pest species in or on					
plants, containers,					
growing media or					
packaging.					

4.9: Efficient energy use

Issue/Activity	Needs attention	Being upgraded	Satisfactory	Complies fully	Doesn't apply
Some electricity is					
purchased from					
renewable 'green' sources					
Energy use is monitored					
Steps have been taken to					
reduce energy use					

4.10 Emergency cleanup strategies

Issue/Activity	Needs attention	Being upgraded	Satisfactory	Complies fully	Doesn't apply
An emergency cleanup					
strategy has been					
developed for pesticide,					
chemical and fertiliser					
spills and leaks					
The strategy includes:					
Clean up procedures,					
Placement and makeup of					
spill kits,					
Emergency contacts.					
Staff are trained in spill					
response procedures					

4.11: Staff training

Issue/Activity	Needs	Being	Satisfactory	Complies	Doesn't
	attention	upgraueu		Tuny	appiy
Staff are trained to be					
aware of and minimise					
their environmental					
impacts when conducting					
their day-to-day duties					
on-site					
Staff training records are					
kept					

Appendix 1: Suppliers of growing media and growing media ingredients

A major environmental risk posed by growing media production and distribution is spread of exotic pest species such as weeds, insects, fungi, amphibians, animals, snails and so on that may compete with our native fauna and flora if allowed to establish and spread.

Growing media suppliers can also come under the scrutiny of environmental agencies from time to time. Sourcing, storing, mixing and composting large quantities of media components can potentially create a range of pollutants. Unless appropriate practices are implemented to minimise these risks the general environment and neighbours may be affected.

A.1.1 Spread of exotic weeds

Practices to minimise spread of exotic weeds include:

- Prevent on-site harbouring of weeds and weed seeds by maintaining a regular weed control program.
- Prevent spread of weeds in transported growing media. For example ensure composting is adequate to kill weed seeds or plant parts in growing media.

A.1.2 Spread of other exotic organisms

Other exotic organisms could be insects, fungi, frogs, snails, fungi, bacteria or other living organisms that are not native to Australia. Practices to minimise spread of other exotic organisms include:

• Conform to regional quarantine restrictions where relevant. For example Red Imported Fire Ant and citrus canker.

A.1.3 Pollutants in runoff water and ground water

As rainwater percolates through aging heaps and composting heaps of bark, sawdust or base materials, it can pick up a range of pollutants such as nutrients, heavy metals, organic matter, soil, resins and tannins. If these are allowed to enter waterways they can reduce water quality and harm species living in the waterways. Similarly pollutants may percolate down through the soil and collect in groundwater.

Practices to minimise these impacts may include:

- Prevent rain and irrigation runoff leaving the property. Collection dams or tanks should have the capacity to collect the runoff water from a 1 in 20 year storm event. The collected water can be reused on-site after appropriate monitoring and treatment. Seal drains and use sediment traps to prevent sediment filling collection dams and reducing their capacity over time.
- Prevent percolation from composting heaps by sealing the composting area with concrete or hardstand, or installing sub-surface drains.
- Prevent percolation to ground water from stored raw materials heaps by storing on relatively impermeable soils, installing sub-surface drains or, where practical, sealing the area with a water barrier such as compacted roadbase or concrete.
- Store and handle fertilisers carefully so they don't enter runoff water.

- Store and handle chemicals, fuel, oil and grease to prevent leaks and spills.
- Adopt soil erosion control techniques (see page 7 "Practices to reduce sediment in wastewater").

A.1.4 Odour

Aging or stored raw material heaps, composting heaps and anaerobic water storages most commonly generate odours affecting neighbours. Growing media suppliers should assess the risk of odour affecting neighbours and implement strategies to reduce odour based on their risk assessment.

Practices to minimise odour may include:

- Avoid the use of raw animal manures on-site.
- Site raw material storage and composting areas well away from neighbours if possible.
- Use buffer zones and/or barriers to reduce odours to neighbours.
- Manage water collection and recycle storages so they don't create odours. Options are to aerate and circulate water storages to ensure aerobic biological activity (anaerobic water may produce hydrogen sulphide and other smelly gases) or disinfest to kill odour-producing bacteria.
- Record complaints and how they have been resolved.

A.1.5 Noise

Assess the risk of noise affecting neighbours and implement strategies to reduce noise based on the risk assessment.

Practices to minimise noise may include:

- Schedule delivery and dispatch vehicles to minimise annoyance to neighbours.
- Use silencing equipment on machinery and vehicles where possible, and regularly maintain them.
- Use buffer zones and/or barriers to reduce noise to neighbours.
- Use noise monitoring equipment and record noise levels if the risk of annoying neighbours is high.
- Record complaints and how they have been resolved.

A.1.6 Air pollution

The most likely causes of air pollution are dust, smoke and vehicle or equipment fumes. Assess the risk of dust, smoke or fumes affecting neighbours and implement strategies to reduce them based on the risk assessment.

Practices to minimise affects of dust, smoke or fumes on neighbours may include:

General

- Site the business well away from neighbours if possible
- Use buffer zones and/or barriers to reduce impacts on neighbours.

Dust

- Seal or stabilise traffic ways.
- If unsealed, water down traffic ways regularly (don't use waste oil to control dust as it may enter waterways and pollute the environment).
- Lightly irrigate raw material, aging and compost heaps with water, especially before disturbing them.
- If possible, avoid deliveries of raw materials, or disturbing raw material or aging heaps, or mixing growing media components when wind direction is toward neighbours.

Smoke

- Do not burn waste, especially plastic, rubber or green waste that generates a lot of smoke. Recycle rather than burn plastic and rubber where possible. Compost organic waste rather than burn it.
- If burning in the open is the only practicable method of disposal of materials, take the following precautions to minimise smoke:
 - Only burn when wind direction is away from neighbours.
 - Do not burn green vegetation.
 - Keep fires small and continually add combustible material. Do not pile material high on fires.
 - Agitate the base of the fire to improve air supply.
 - o Avoid adding incombustible materials to fires.

Fumes

• Maintain vehicles and equipment.

A.1.7 Waste management

See Section 3.4 "Managing waste".

A.1.8 Managing native vegetation, habitats and wildlife

See Section 3.5 "Managing native vegetation, habitats and wildlife".

A.1.9 Energy efficiency

See section 3.6 "Efficient energy use".

Appendix 2 NIASA Accreditation Checklist – Environment (Growing Media Suppliers)

App 2.1 Spread of exotic weeds

Issue/Activity	Needs	Being	Satisfactory	Complies	Doesn't	**In
	attention	upgraded		fully	apply	NIASA?
A regular on-site weed						
control program is						
maintained						
Composting process is						
adequate to kill weed						
seeds, plant parts and						
pests						

App 2.2 Spread of other exotic organisms

Issue/Activity	Needs	Being	Satisfactory	Complies	Doesn't	**In NLASA2
	attention	upgraueu		Tuny	appry	MASA:
Regional quarantine						
restrictions and						
regulations are observed						

App 2.3 Pollutants in runoff water and ground water

Issue/Activity	Needs attention	Being ungraded	Satisfactory	Complies fully	Doesn't apply	**In NIASA?
All runoff water on the		-pg			"PP-J	11110111
site is collected and						
stored.						
Runoff water is						
monitored for pH,						
nutrients, BOD.						
Raw material						
storage/aging areas are						
either sited on						
impermeable ground,						
have sub-surface drainage						
installed and /or are						
sealed.						
Chemicals and fertilisers						
are stored and handled to						
prevent spillages and						
leaks						

Issue/Activity	Needs attention	Being upgraded	Satisfactory	Complies fully	Doesn't apply	**In NIASA?
Soil erosion control methods are used						

App 2.4 Odour and noise pollution

Issue/Activity	Needs attention	Being ungraded	Satisfactory	Complies fully	Doesn't	**In NIASA?
The risk of odour and	uttention	upgruuou		iung	upp-y	
noise affecting						
neighbours has been						
assessed.						
If impact on neighbours is						
likely:						
Actions have been taken						
to reduce the risk of						
odour and noise affecting						
neighbours						
Neighbour complaints						
and how they have been						
resolved are recorded						

App 2.5 Air pollution

Issue/Activity	Needs	Being	Satisfactory	Complies	Doesn't	**In
	attention	upgraded		fully	apply	NIASA?
The risk of air pollution						
affecting neighbours and						
the environment has been						
assessed.						
If impact on neighbours is						
likely:						
Actions have been taken						
to reduce air pollution						
Air pollution complaints						
and how they have been						
resolved are recorded						

App 2.6 Waste management

See Section 5.7

App 2.7 Managing native vegetation, habitats and wildlife

See Section 5.8

App 2.8 Energy efficiency

See Section 5.9

App 2.9 Emergency cleanup strategies

See Section 5.10

App 2.10: Staff training

See Section 5.11

Appendix 3: Sample documents

Records

New

Wastewater quality record

Irrigation water use record

Pesticide and chemical inventory

Complaints register

Noise monitoring record (To be used if risk assessment or complaints indicate a high risk of neighbour discomfort from noise generated by the business).

Staff training record

Existing

Water disinfestation record (in NIASA Best Management Practice Guidelines)

Irrigation water quality record (in NIASA Best Management Practice Guidelines)

Growing media quality record (in NIASA Best Management Practice Guidelines)

Spray record (in NIASA Best Management Practice Guidelines, or Pesticide Management Diary CD ROM)

Plans

Waste management plan

Emergency response plan

Wastewater Quality Record

Business name:

Date	pН	EC	Nitrate	Phosphorus	BOD	Other	Comments	Signature

Irrigation Water Use Record

Business name:

Date	Meter reading	Signature	Date	Meter reading	Signature

Pesticide and Chemical Inventory

Business Name:

Purchase date	Product	Place of purchase	Quantity	Batch no.	Manufacture /expiry date	Permit expiry date	Disposal comments
						(if applicable)	

Stocktake	Date:	Signed:	Date:	Signed:
				-

Complaints Register

Business name:

Date	Nature of complaint	From whom	Action taken Y/N	How resolved	Signature

Noise monitoring record

Business Name:

Date	Recording position	Noise reading (decibels)	Comments	Date	Recording position	Noise reading (decibels)	Comments

To be used if risk assessment or complaints indicates a high risk of neighbour discomfort from noise generated by the business.

Staff training record

Business/Grower Name:

Training subject Name	Chemical application					

C = staff member has completed an accredited chemical user's training course

Waste Management Plan

Business name:

Waste material	Reduce, reuse, recycle or disposal plan

Emergency Response Plan

Business name:

Potential incident	Response

Appendix 5: Abbreviations

BMP	Best Management Practices
BOD	Biological Oxygen Demand. A measure of oxygen consumed by decaying organic matter present in water. High BOD levels in water indicate oxygen available for aquatic life will be consumed, potentially killing these organisms.
EMS	Environmental Management Systems
NIASA	Nursery Industry Accreditation Scheme Australia

Appendix 5

Environmental Best Management Practice Chapter

Garden Centres

Guidelines for Managing the Environment

Garden Centres

Australian Garden Centre Accreditation Scheme (AGCAS)
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Environment

Guidelines and assessment criteria

The purpose of this section is to provide guidance to garden centres on environmental best management practices. By following these guidelines a garden centre can identify and reduce or prevent harmful environmental impacts and increase or enhance their positive impacts on the environment.

In addition, this section offers garden centres the opportunity to assess their environmental performance (refer AGCAS Internal Review).

1. Is the centre manager aware of local authority regulations concerning the environment?

A large number of Federal and State government Acts or pieces of legislation cover most aspects of the environment. Acts such as the federal *Environmental Protection & Biodiversity Conservation Act 1999* and State/Territory Acts addressing environmental protection broadly require the community to exhibit environmental care.

Local authorities are responsible for many of the 'on-the-ground" interpretations of environmental legislation, so businesses are advised to maintain regular liaison with them concerning development and environmental issues.

For a detailed discussion of legislative requirements affecting the nursery industry, refer to the Nursery & Garden Industry Australia's report "Environmental Legislation Investigation (2003)". This publication explains the range of legislation enacted by Federal and State/Territory governments and how they may impact on nurseries and garden centres. It is available from Horticulture Australia.

- Are you aware of the need to comply with legislation regarding the impact of your business operations on the environment?
- Do you maintain regular liaison with local authorities concerning development and environmental issues?

2. Is the spread of exotic pests and diseases controlled?

Exotic pests and diseases may include weeds, insects, fungi, microorganisms, amphibians and other animals that are not native and may be declared through legislation as being a pest. If these organisms are not controlled they may compete out native species or make the environment unsuitable or hazardous for native plants and animals. Exotic pests and diseases are most likely to be spread in the following ways:

- o Transported in or on plants, pots, media, packaging or vehicles
- Sale of plant species that are regulated or identified as environmental weeds, and

- Harboured in garden centre displays, ponds, permanent vegetation (landscaped areas) or waterways.
- Are you aware of, and do you conform to, quarantine regulations that may affect you?
- Do you source plants and landscape products from reputable suppliers (preferably NIASA accredited suppliers)?
- Do you know the nursery plant species regulated or identified as environmental weeds?
- Do you avoid selling nursery plant species regulated or identified as environmental weeds?
- Do you maintain clean and tidy premises and regularly check premises and plants for quarantine pests and diseases where there is a known risk?

3. Is run off water from the garden centre monitored?

Generally runoff water from garden centres is free of excess nutrients, chemicals or sediment, however garden centres should regularly check runoff water quality and review their practices if pollutant levels exceed local authority guidelines. Nutrients, chemicals and sediment entering drains and waterways have detrimental effects on downstream ecosystems. Potential sources of pollutants may be:

- Residual amounts of nutrients and herbicides in the media of potted plants received from production nurseries that may be leached out during watering or rainfall.
- Fertilisers and chemicals applied to landscaped areas and permanent display plantings.
- Fertilisers and chemicals in waste plant and media heaps.
- Fertiliser and chemical spills and leaks from storage areas or during handling

Floating litter in runoff water (for example styrofoam beads and bark in some potting mixes) can pollute the pristine visual appearance of downstream environments, and in some cases may affect native wildlife.

- Do you monitor runoff water from the garden centre once every 12 months?
- Consider establishing a runoff water collection, treatment and recycling system if establishing a new garden centre.
- Do you prevent floating litter entering drains and waterways in runoff water?

See Appendix 1 for further information about monitoring runoff water.

4. Does the centre practice and encourage sustainable gardening and conservation of native plants and animals?

- If remnant or riparian native vegetation is present on your site, is it retained and protected?
- Have you included local native species in your site landscaping?
- Do you promote and sell local native plant species to customers?

• Do you encourage the community to use environmentally friendly (sustainable) gardening practices?

See Appendix 2 for further information about promoting good environmental practices with customer.

5. Does the centre use water efficiently?

- Is a meter installed on your water supply and do you maintain a record of water use?
- Have you determined your water needs and developed an irrigation and water use strategy to stay within the plan?
- Have you grouped plants with similar water needs and set up efficient irrigation 'blocks' for each group? For example, some groupings with low water needs can be watered separately to the rest of the garden centre with a low application irrigation type and schedule.
- Do you maintain and regularly service your irrigation system so it operates at full efficiency at all times?
- Do you know and meet all local authority regulations governing use of water from town supplies, streams and bores?

6. Is air, noise, odour and visual pollution being managed appropriately?

These environmental issues are mainly a localised problem to neighbours and to your customers so being sensitive to your impacts on them will greatly reduce any potential problems. You need to assess the potential risk of neighbour and customer complaints and develop preventative strategies based on your assessment. If the risk is assessed as high, then potential pollution-producing activities should be sited as far away from your nearest neighbours and customer sales areas as possible, and establish barriers such as trees or fences to minimise affects on neighbours and customers.

Air pollution

Air pollution is usually derived from dust, smoke, vehicle and equipment fumes or fumes from pesticides and chemicals.

Avoiding dust

- Are all on-site vehicle traffic ways sealed using (as a minimum) compacted road base? (Note: waste oil should not be applied to roadways to control dust. Oil spread onto roadways can move off-site in runoff water causing pollution of waterways).
- Are bulk soil and media storage bays and areas sealed using (as a minimum) compacted road base?
- Is dust from handling bulk soils, media and mulches controlled?

Avoiding smoke

• Do you avoid burning rubber, plastic or green waste on-site?

Avoiding fumes

- Are vehicles and equipment maintained to minimise fumes?
- Are pesticides and chemicals handled and stored in a way that prevents leaks, spills and drift?

Noise pollution

Potential sources of noise could include vehicles, forklifts, tractors, pumps, heaters, airconditioners, glasshouse vents, mowers, sprinklers, phones, PA systems and sirens.

- Are separation zones, enclosures or barriers used where necessary to reduce noise to neighbours and customers?
- Are noisy vehicles and equipment only operated during daylight hours or during least sensitive times? You may need to consider reducing length of time of operation or number of times operated to acceptable levels if risk of neighbour or customer complaints is high.

Odour pollution

Odour is most likely to result from bulk soil, media or organic manure storage areas.

- Do you avoid using or storing bulk raw organic manures or other smelly materials on-site?
- Are buffer zones and/or barriers used to reduce odours to neighbours where the risk of neighbour complaints is high?

Visual pollution

- Is waste collected into designated storage areas that are screened from neighbours and customers?
- Are all areas of the garden centre maintained in a neat and tidy condition?

7. Are waste management practices adequate?

The basic options for waste management are to reduce, reuse, recycle or send to landfill. Sending waste to a dump to be included in landfill should be a last option for dealing with waste after all the other options have been explored. The objective of good waste management is to minimise waste going into landfill.

- Have all types of waste generated in the business been identified?
- Has a waste management plan for all waste products been developed? (See "Sample documents").
- Do you avoid accumulating large amounts of waste on site?
- Are waste recycling programmes used where possible?
- Are local authority regulations followed for on-site disposal of waste?

• Is a customer plant container recycling programme established and promoted?

See Appendix 3 for further information about waste management.

8. Are pesticides and chemicals used and stored appropriately?

This section applies to pesticides and chemicals used by the garden centre for pest, disease and weed control, and chemicals used for cleaning. Refer to Appendix 1 and 2 of the Australian Garden Centre Accreditation Scheme (AGCAS) manual for information on storage and handling of pesticides and chemicals for use in the garden centre.

Activities to reduce potential impacts of pesticides and chemicals on the environment and customers are:

- Do you avoid pesticide and chemical use in customer areas? If treatment of potted plants for pests or diseases is needed, take affected plants to a non-customer area for treatment and do not return them to the customer display area until after the withholding period for the chemical has passed. Alternatively use non-toxic pest control agents where they are known to be effective (such as detergents or pyrethrum sprays).
- Do you use non-pesticide strategies for pest, disease and weed control in all parts of the nursery (including landscaped areas) as much as possible?

If there is a need to use pesticides:

- Do you only use pesticides that are registered for use in your State or have an Australian Pesticides and Veterinary Medicines Authority (APVMA) permit for your State.
- Do you apply pesticides according to label instructions?
- Do you regularly maintain and calibrate pesticide application equipment?
- Do you ensure at least one person in the business has attended an accredited chemical user's course, and those staff handling and applying pesticides have been adequately trained?
- Have you constructed and sited pesticide mixing and filling areas to avoid pesticide movement into drains and waterways?
- Do you avoid pesticide spray drift by only spraying pesticides when wind speed is between 3 km/hr and 15km/hour, and by avoiding very hot conditions?

9. Is energy being used efficiently?

- Does the garden centre source a proportion of their energy use from 'green power'.
- Has the garden centre been assessed for energy use and developed plans to save energy?
- Is energy efficient equipment used?
- Is energy efficient lighting used? For example, compact fluorescent bulbs have about onequarter lower wattage and eight times the life of standard incandescent bulbs.
- Is there a regular maintenance program for all vehicles and equipment.?

See Appendix 4 for further information about reducing energy use.

10. Does the centre have an emergency response plan?

An emergency response plan is a plan of action to deal with environment-threatening events such as fuel, oil, chemical, fertiliser, effluent or toxic waste spills, leaks or discharges to waterways.

- Does the centre have a documented emergency response plan?
- Are staff trained to quickly respond to emergencies according to the plan.

An example template for an emergency response plan is in 'Sample Documents'

Appendix 1: Pollutants in runoff water

The nursery industry is coming under close scrutiny about nutrients, chemicals, sediment and litter in runoff water. Runoff water (or wastewater) consists of the water that drains from all parts of the garden centre after rain or irrigation and enters off-site drains and waterways. The close proximity of most garden centres to populated areas and sensitive water catchments sharpens community concern about runoff water from these sites.

Established garden centres

Monitor runoff water every 12 months to ensure nutrients, chemicals and sediment (usually from soil erosion or landscape material storage areas) are within levels acceptable to local authorities. Contact your local authority to determine their requirements.

Tests should include nitrate and phosphate, pH, electrical conductivity and a visual assessment of sediment. Accredited laboratories can test for the first four parameters, or equipment is available to conduct some of these tests on-site. A more objective measure of sediment in runoff water could be made using a turbidity tube. A turbidity tube is a clear plastic cylinder with markings on the bottom. It has scaled units on the side ranging from 10 to 400 'Neoflexic Turbidity Units' (NTU's). The general idea is to determine the depth of water at which you can no longer see the bottom markings through the water and take the NTU reading on the side of the tube corresponding with the water level in the tube.

Runoff water samples should be taken during irrigation or rain where water leaves your property. Sample runoff from several points if necessary, to include runoff from potted plant sales areas as well as garden, landscape supply and work areas.

If monitoring indicates high levels of pollutants in runoff water the garden centre should review its activities to identify the source of pollutant, correct the problem and establish practices that will prevent pollutants entering their runoff water.

Floating material is usually derived from spilled potting mix components such as styrene beads and floating bark, bits of plastic waste or components of bulk stored landscaping materials. It can be removed from runoff water by installing either a baffle system or an interceptor pit within the drainage line. They need to be cleaned regularly. For more information refer to Chapter 3 of "Managing water in plant nurseries" published by NSW Agriculture.

New garden centres

If establishing a new garden centre, consider designing and installing a water collection, treatment and recycling system. This saves on water consumption and prevents runoff into offsite drains and waterways.

Water is becoming progressively more expensive and harder to access throughout Australia and more water is being returned to river systems to maintain environmental flows. Water providers are moving toward a more structured pricing system to encourage consumers to conserve and value the resource, so installing a recycling system makes good business sense. An effective recycling system involves the following:

- Intercept and divert water from outside your property away from your nursery area.
- Seal nursery areas to minimise infiltration of wastewater into the soil and to direct wastewater to on-site drains.
- Plan layout for drainage and prepare drains to collect wastewater and deliver to a collection dam or tank. Follow local authority guidelines for designing drainage and storage capacity.
- Set up filters and treatment systems to remove litter and undesirable chemicals.
- Collect wastewater into storage ponds. Ensure storage capacity will accommodate storm/rain water and irrigation runoff.
- Disinfest wastewater before recycling or reusing to remove pathogens. (refer to NIASA Best Management Practice Guidelines section 1.1.1).
- If necessary aerate and circulate, or treat, stored water to encourage biological breakdown of pollutants and nutrients and prevent algae growth.

Further information about monitoring and treating runoff water is available in:

- Managing water in plant nurseries a guide to irrigation, drainage, and water recycling in containerised plant nurseries. NSW Agriculture, 2nd edition, 2000.
- Nursery Industry water management best practice guidelines. Nursery & Garden Industry Australia 1997.

Appendix 2: Promoting good environmental practices to the community

Garden centres are ideally positioned to encourage the community to adopt good environmental practices. Customers buy plants and ask for advice on a wide range of topics that provide opportunities to educate them about environmentally friendly gardening practices and planting local native plants. Garden centres could also have regular educational programs for the community related to awareness and care of the environment.

Activities encouraged for garden centres include:

- Stocking and selling local native plant species and promoting their use.
- Providing advice to customers that encourage environmentally friendly gardening practices such as composting and mulching, minimal pesticide and chemical use, efficient water and fertiliser use, and practices that minimise nutrient losses into drains and waterways.
- Conducting community education programs that provide knowledge and skills to protect and enhance wildlife and their habitats, and practice sustainable gardening.

For educational resources and information about sustainable gardening, contact your State Industry Development Officer. Another online resource is the Victorian-based not-for-profit organization Sustainable Gardening Australia <u>http://www.sgaonline.org.au</u>.

A useful reference about storage, use and advice about pesticides is: Advising gardeners about controlling pests, diseases and weeds. The Nursery Papers 1999:2

Appendix 3: Managing waste

Waste is an increasing environmental issue. Sending waste to landfill is a poor option that affects the whole community because landfill is not a good use of valuable space and can result in other environmental impacts such as creation of greenhouse gases and groundwater pollution.

Examples of waste items include:

- Oil, grease, batteries, tyres and machinery parts
- Plastic pots, containers, packaging, strapping and labels
- Used irrigation lines and equipment
- Used pesticide and chemical containers
- Waste from sales or display areas
- Foliage from pruning and detailing
- Reject plants, pots and media
- Office, cafe and staff waste.

To minimise landfill, **reduce waste**, then **reuse waste**, then **recycle waste**, so that only a very small amount is left over to be sent to landfill. Reducing and reusing waste is simple, but has a big impact on waste.

Reduce waste

Look for opportunities to minimise the creation of waste. For example:

- Wherever possible choose methods and equipment that give extended life and produce relatively low amounts of waste for disposal.
- Offer and encourage use of biodegradable carry bags, rather than plastic bags, for customers.

Reuse waste

Look for ways to reuse waste items. For example:

- Store materials such as timber and steel for reuse in the business.
- Reuse waste growing media on garden beds and landscaping.
- Many products and materials that cannot be effectively reused in the nursery may be valuable to other organisations. Consider donations such as unwanted supplies, office

equipment, excess building materials and so on to schools, non-profit organisations, community groups or other businesses.

Recycle waste

Look for opportunities to recycle waste. For example:

- Compost waste vegetation on-site.
- Use recyclable goods and packaging where possible. Recyclable material needs to be stored separately after use in a designated area on site for ease of collection. Waste companies may leave recycling containers on your site or at central locations free of charge.
- Contract a licensed recycle business to collect recyclable waste.
- Use recycle programmes for oil, batteries, rubber products, cardboard, paper and tyres.
- Use incoming packages for outgoing shipments.
- Establish a customer plant container return system and encourage its use. Include returned plant containers in a recycling program.

Dispose of waste responsibly

Waste should be disposed of responsibly on-site, so that it doesn't cause an additional pollution problem. For example burning plastics or green vegetation causes air pollution.

For used pesticide containers, follow DrumMuster guidelines for dealing with used pesticide containers (<u>www.drummuster.com.au</u>).

Appendix 4: Reducing energy use

Most of our energy (including more than 90% of our electricity) comes from fossil fuels such as oil, coal and gas. These valuable natural resources are limited and must be used carefully. Burning these fossil fuels pollutes the environment and puts greenhouse gas emissions into the atmosphere, contributing to global warming.

You can help the environment by switching to more environmentally friendly energy sources and by reducing energy use by selecting and maintaining vehicles, equipment and lighting for improved energy efficiency.

Switching to more environmentally friendly energy sources

Most energy supply companies now offer what is called "green power" as a proportion of your total energy needs. This is produced from renewable energy sources such as wind energy, hydro-power and solar energy. This electricity costs a little more than conventional power from coal-fired power stations; however, costs can be maintained at the same total energy cost by improving energy use efficiency.

Reducing energy use

A good first step is to conduct an energy audit of your business to identify areas for improvement. Energy audit companies can provide expert advice on how to save electricity. These companies are listed under 'Energy management consultants' in the Yellow Pages. Alternatively energy audit companies Australia-wide are listed on the NSW Government Sustainable Energy Development Authority website at:

http://www.seda.nsw.gov.au/esa/middlesub.asp (look up 'Energy auditors'). Some States have more comprehensive State-specific energy auditor lists as follows:

WA: http://www1.energysmartdirectory.com

Vic: http://www.seav.vic.gov.au

Australian Garden Centre Accreditation Scheme (AGCAS)

Internal Review

ENVIRONMENT

		Not applicable	Unsatisfactory	Needs improvements	Satisfactory	Good	Outstandingly good
1.	Is the centre manager aware of local authority regulations concerning the environment?						
•	Regular liaison with local authorities concerning development and environmental issues.						
•	Aware of local authority regulations.						
2.	Is the spread of exotic pests and diseases controlled?						
•	Aware of relevant quarantine regulations						
•	Plants and landscape supplies are sourced from reputable suppliers						
•	The centre does not sell nursery plants regulated or identified as environmental weeds.						
•	Regularly monitor for quarantine pests or diseases where there is a known risk						
3.	Is runoff water from the garden centre monitored?						
•	Runoff water is monitored for quality every 12 months						
•	Floating litter is prevented from entering drains and waterways in runoff water						
4.	Does the garden centre practice and promote environmentally friendly gardening and conservation of native vegetation and wildlife? If present, on-site remnant or riparian vegetation is retained.						
•	Unused, cleared areas of the site are replanted with local native species. Local native plant species are promoted and sold to						
•	customers. Customers and the general community are encouraged to use sustainable gardening practices.						

	Not applicable	Unsatisfactory	Needs improvements	Satisfactory	Good	Outstandingly good
5. Is water being used efficiently?						
 Water use is metered and recorded. A water use reduction strategy has been developed and implemented. Plants are grouped and irrigated in blocks according to their water needs. The irrigation system is regularly maintained. 						
6. Is air, noise, odour and visual pollution being						
managed appropriately?						
• The potential risk of neighbour and customer						
• Where the risk is high preventative strategies have						
been developed to minimise air, noise and odour						
pollution.						
• Unsightly areas (such as waste storage) are screened from neighbours and customers						
 All areas of the garden centre are maintained in a 						
neat and tidy condition.						
7. Are waste management practices adequate?						
• A waste management plan has been developed and						
implemented, incorporating waste reduction, reuse						
and recycling.						
8. Are pesticides and chemicals used and stored						
 appropriately? Pesticides and chemicals are not used in customer 						
areas.						
• Non-pesticide strategies for pest, disease and weed						
control are used in all parts of the nursery (including landscaped areas) as much as possible						
 Pesticides are used responsibly (see text). 						
• Pesticides used by the garden centre are handled and						
stored properly (see Appendices 1 & 2 of AGCAS).						
9. Is energy being used efficiently?						
• The garden centre sources a proportion of it's energy use from 'green power'						
 The garden centre has developed and implemented 						
plans to reduce energy use.						

Comments – Environment (identify and list any shortcomings)

Question Number	
_	

Sample document templates

Waste Management Plan

Emergency Response plan

Waste Management Plan

Business name:

Waste material	Reduce, reuse, recycle or disposal plan
Customer pots	Set up recycle bins at front of centre for plant pots. Encourage customers to return used pots into recycle bins
Cardboard packaging	Place in separate recycling area. Use recycling contractor to remove.
Plastic waste	Separate into recyclable and non-recyclable plastic and store separately. Use recycling contractor to remove recyclable plastic. Send non-recyclable plastic to landfill.

Emergency Response Plan

Business name:

Potential incident	Response
Chemical spills	Control the spill to stop further leakage.
	Quickly prevent spread of the chemical.
	• Apply an absorbent such as sand/soil/sawdust.
	Properly dispose of used absorbent material.
	Check the product's Material Safety Data Sheet for details
	Report the spill if it is large or enters a drain or waterway.